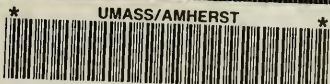


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REPORT
OF THE
CATTLE COMMISSIONERS

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ANNUAL REPORT

OF THE

BOARD OF CATTLE COMMISSIONERS

1897

OF THE

COMMONWEALTH OF MASSACHUSETTS,

IN ACCORDANCE WITH SECTION 51 OF CHAPTER 491 OF
THE ACTS OF 1894.

JANUARY 11, 1898.

BOSTON:
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1897

REPORT.

To the Honorable Senate and House of Representatives.

As provided for in section 51 of chapter 491 of the Acts of the year 1894, the Board of Cattle Commissioners hereby presents the following report of its work for the year 1897.

As was the case last year, the law of 1894 continued to be the basis of the work for the year 1897; and, as in 1896, the work has been continued under the following heads:—

First.—The supervision and direction of the work of the local inspectors appointed by the cities and towns under the provisions of chapter 491 of the Acts of 1894, and the examination of all animals quarantined by them as suspected of being afflicted with contagious disease.

Second.—The examination of cattle coming into the markets at Brighton, Watertown and Somerville from without the State for sale.

Third.—The examination and identification of cattle coming from without the State upon special permit.

Fourth.—The conduct of laboratory and stable experiments, to determine problems connected with the work of the Board.

Under section 1 of chapter 491 of the Acts of the year 1894, the mayor and aldermen of cities and the selectmen of towns must appoint one or more persons to be inspectors of animals and provisions. These inspectors must make regular and thorough inspection of all neat cattle, sheep and swine found within the limits of their several towns, when ordered to do so by the Board of Cattle Commissioners. They shall also make inspection of any domestic animal, whenever they have knowledge, or reason to believe, that such animal is affected with any contagious disease; and they shall also examine at the time of slaughter all neat cattle, sheep and swine slaughtered at slaughter houses licensed under the provision of this law.

The names of the inspectors appointed under this act are as follows : —

Abington,	John N. Chamberlain.
Acton,	Moses A. Reed.
Acushnet,	Philip A. Bradford.
Adams,	Andrew G. Potter.
Agawam,	Edwin Leonard.
Agawam,	Elijah D. Allen.
Alford,	Samuel K. Williams.
Amesbury,	Edward S. Worthen.
Amherst,	Henry E. Paige.
Andover,	Charles H. Newton.
Arlington,	Alonzo S. Harriman.
Arlington,	Henry L. Alderman.
Ashburnham,	Charles W. Whitney, 2d.
Ashby,	Charles C. Damon.
Ashfield,	Walter G. Lesure.
Ashfield,	Homer S. Day.
Ashland,	Samuel D. Witt.
Ashland,	Edmund A. Stone.
Athol,	Oscar F. Stearns.
Attleborough,	Thomas L. Swift.*
Attleborough,	George Mackie.
Auburn,	Emory Stone.
Avon,	Charles E. May.
Ayer,	William H. Dudley.
Barnstable,	Alfred Crocker.
Barnstable,	John J. Harlow.
Barre,	John L. Smith.
Becket,	Lyman N. Cone.
Becket,	Edwin Lee.
Bedford,	Henry Wood.
Belchertown,	Guy C. Allen.
Bellingham,	Carroll E. White.
Belmont,	Benjamin A. Harris.
Berkley,	Eliphalet Terry.
Berlin,	Robert B. Wheeler.
Bernardston,	Charles Bowker.
Beverly,	Horace D. Lambert.
Billerica,	William H. Hutchins.
Blackstone,	Daniel H. Cooney.
Blackstone,	Elias M. Billings.
Blandford,	George Cadwell.
Blandford,	E. B. Gibbs.
Blandford,	Frank J. Candee.
Bolton,	Henry F. Haynes.

* Removed.

Boston,	.	.	.	.	Alexander Burr.
Boston,	.	.	.	.	J. C. Grouse.
Boston,	.	.	.	.	T. F. Kelley.
Boston,	.	.	.	.	George W. Roberts.
Bourne,	.	.	.	.	Noble P. Swift.
Boxborough,	.	.	.	.	Philip W. Cunningham.
Boxford,	.	.	.	.	Charles A. Andrew.
Boxford,	.	.	.	.	George B. Killam.
Boylston,	.	.	.	.	Luther S. Hapgood.
Braintree,	.	.	.	.	James M. Cutting.
Brewster,	.	.	.	.	Henry E. Baker.
Bridgewater,	.	.	.	.	Calvin Pratt.
Brimfield,	.	.	.	.	Porter A. Parker.
Brockton,	.	.	.	.	Simeon Mitchell.
Brockton,	.	.	.	.	Lucas W. Alden.
Brookfield,	.	.	.	.	George Allen.
Brookline,	.	.	.	.	Frederick H. Osgood.
Buckland,	.	.	.	.	Henry L. Warfield.
Burlington,	.	.	.	.	James N. Stuart.
Cambridge,	.	.	.	.	Charles E. Hadcock.
Canton,	.	.	.	.	Patrick J. Cronon.
Carlisle,	.	.	.	.	George P. Davis.
Carver,	.	.	.	.	Benjamin W. Robbins.
Charlemont,	.	.	.	.	William B. Avery.
Charlemont,	.	.	.	.	Horace Temple.
Charlton,	.	.	.	.	Stephen Hammond.
Chatham,	.	.	.	.	Isaac B. Young.
Chelmsford,	.	.	.	.	Edwin C. Perham.
Chelsea,	.	.	.	.	William Stinson.
Cheshire,	.	.	.	.	William P. Bennett.
Chester,	.	.	.	.	Daniel B. Holcomb.
Chester,	.	.	.	.	Edward L. Higgins.
Chesterfield,	.	.	.	.	George W. Rogers.
Chesterfield,	.	.	.	.	Clayton N. Rhoades.
Chicopee,	.	.	.	.	Thomas Goodwin.
Chicopee,	.	.	.	.	Irving H. Elmer.
Chilmark,	.	.	.	.	Freeman Hancock.
Clarksburg,	.	.	.	.	James Mixer.
Clinton,	.	.	.	.	Eugene H. Lehnert.
Cohasset,	.	.	.	.	Caleb F. Nichols.
Colrain,	.	.	.	.	C. Webster Smith.
Colrain,	.	.	.	.	H. Spencer Meacham.
Concord,	.	.	.	.	Horace Tuttle.
Conway,	.	.	.	.	Gordon H. Johnson.
Cottage City,	.	.	.	.	Edmund G. Beetle.
Cummington,	.	.	.	.	Edward F. Warner.
Cummington,	.	.	.	.	Myron D. Trow.
Cummington,	.	.	.	.	Finley V. Bates.
Dalton,	.	.	.	.	William Miller.

Dalton,	.	.	.	.	William C. Brague.
Dana,	.	.	.	.	Alfred W. Doane.
Danvers,	.	.	.	.	Charles S. Moore.
Dartmouth,	.	.	.	.	Charles W. Howland.
Dartmouth,	.	.	.	.	Charles H. Negus.
Dedham,	.	.	.	.	Edward Knobel, Jr.
Deerfield,	.	.	.	.	Dwight A. Hawks.
Deerfield,	.	.	.	.	Edward D. Jewett.
Dennis,	.	.	.	.	Edwin Whittemore.
Dennis,	.	.	.	.	Charles E. Baker.
Dighton,	.	.	.	.	Nathan O. Walker.
Dighton,	.	.	.	.	William H. Walker.
Dighton,	.	.	.	.	George A. Clark.
Douglas,	.	.	.	.	Edwin P. Heath.
Douglas,	.	.	.	.	James Dermody.
Dover,	.	.	.	.	James McGill.
Dracut,	.	.	.	.	William S. Eaton.
Dudley,	.	.	.	.	Monroe W. Ide.
Dunstable,	.	.	.	.	Franklin N. Tolles.
Duxbury,	.	.	.	.	George Bradford.
Duxbury,	.	.	.	.	John K. Parker.
East Bridgewater,	.	.	.	.	William T. Green.
East Longmeadow,	.	.	.	.	Edwin Indicott.
Eastham,	.	.	.	.	Reuben H. Horton.
Easthampton,	.	.	.	.	Fordyce Whitmarsh.
Easton,	.	.	.	.	Edward R. Hayward.
Edgartown,	.	.	.	.	Christopher R. Beetle.
Egremont,	.	.	.	.	William F. Crippen.
Enfield,	.	.	.	.	Albert R. House.
Enfield,	.	.	.	.	William H. Bush.
Erving,	.	.	.	.	Frank W. Loveland.
Essex,	.	.	.	.	C. Amos Burnham.
Essex,	.	.	.	.	Edward F. Knowlton.
Everett,	.	.	.	.	William Stinson
Fairhaven,	.	.	.	.	Ebenezer G. Grinnell.
Fall River,	.	.	.	.	Hilaire Bisailon
Falmouth,	.	.	.	.	Barzillai C. Cahoon.
Falmouth,	.	.	.	.	Herbert H. Lawrence.
Fitchburg,	.	.	.	.	Otis F. Lord.
Florida,	.	.	.	.	Nathan W. Kemp.
Foxborough,	.	.	.	.	A. W. Draper.
Foxborough,	.	.	.	.	F. G. Lillyman.
Framingham,	.	.	.	.	Joseph G. E. Page.
Franklin,	.	.	.	.	William F. King.
Freetown,	.	.	.	.	Palo Alto Pierce.
Freetown,	.	.	.	.	James Webb.
Freetown,	.	.	.	.	Charles H. Read.
Gardner,	.	.	.	.	Augustus S. Cleaves.
Gardner,	.	.	.	.	Frank B. Page.

Gay Head,	Samuel J. Hasking.
Georgetown,	Samuel T. Poor.
Georgetown,	J. Winfred Yeaton.
Gill,	John L. S. Moore.
Gloucester,	Daniel G. Cressy.
Goshen,	Willis A. Smith.
Gosnold,	Josiah W. Tilton.
Grafton,	Perley Goddard.
Granby,	George L. Witt.
Granby,	C. D. Lyman.
Granville,	George W. Cone.
Granville,	Joseph Welch.
Great Barrington,	Edwin Hurlburt.
Great Barrington,	George H. Cobb.
Greenfield,	Mark L. Miner.
Greenwich,	Walter H. Glazier.
Groton,	Solon R. Dodge.
Groveland,	Thomas E. Snell.
Hadley,	Charles H. Hunt.
Hadley,	Homer L. Cowles.
Halifax,	Jabez P. Thompson.
Hamilton,	George E. F. Dane.
Hampden,	Moses H. Warren.
Hancock,	James S. Goold.
Hanover,	Edwin B. Dwelley.
Hanson,	Ezra White.
Hardwick,	John N. Hillman.
Harvard,	Mark A. Farnsworth.
Harwich,	John A. Baker.
Hatfield,	E. S. Warner.
Haverhill,	Grantley Bickell.
Haverhill,	Doane Cogswell.
Hawley,	L. W. Temple.
Heath,	V. D. Thompson.
Hingham,	Robert F. Robinson.
Hinsdale,	Frank C. Phillips.
Holbrook,	Z. P. Jordan.
Holden,	E. W. Merrick.
Holden,	W. A. Jordan.
Holden,	Allen Brown.
Holden,	Alvin Thurston.
Holland,	A. J. Bagley.
Holliston,	Isaac A. Smith.
Holyoke,	Bernard F. Bigelow.
Hopedale,	Waldo Phipps.
Hopkinton,	Winslow W. Claffin.
Hubbardston,	John H. Burch.
Hudson,	A. L. Cundall.

Hull,	Harvey T. Litchfield.*
Hull,	Darius W. Gilbert.
Huntington,	Heman Burr.
Huntington,	Fred W. Lyman.
Hyde Park,	Joseph M. Kiggen.
Ipswich,	Daniel S. Appleton.
Kingston,	E. Elbridge Atwood.
Lakeville,	Isaac Sampson.
Lancaster,	Henry F. Hosmer.
Lancaster,	A. W. Carr.
Lanesborough,	William P. Talcott.
Lawrence,	John F. Winchester.
Lawrence,	Valentine T. Sellers.
Lee,	John H. McAllister.
Leicester,	Henry B. Watts.
Lenox,	Charles C. Flint.
Leominster,	George M. Kendall.
Leverett,	O. C. Marvell.
Lexington,	Charles M. Parker.
Leyden,	Ezra Foster.*
Leyden,	Albert J. Shattuck.
Lincoln,	Roger Sherman.
Littleton,	Joseph N. Murray.
Longmeadow,	Spencer W. Gates.
Lowell,	Walter A. Sherman.
Ludlow,	Adelbert L. Bennett.
Lunenburg,	Charles E. Woods.
Lunenburg,	Micah M. Boutwell.
Lynn,	William E. Welts.
Lynnfield,	William R. Roundy.
Malden,	James H. Kimball.
Manchester,	John Riordan.
Mansfield,	Joseph N. Tebbetts.
Marblehead,	Benjamin F. Martin, Jr.
Marion,	George F. Richards.
Marlborough,	Patrick J. Mahoney.
Marshfield,	Franklin W. Hatch.
Mashpee,	Darius Coombs.
Mattapoisett,	David H. Cannon.
Maynard,	Joel F. Parmenter.
Medfield,	Francis D. Hamant.
Medford,	Henry F. Moore.
Medway,	Edward Whiting.
Melrose,	F. P. Sturges.
Mendon,	Albert W. Gaskill.
Merrimac,	Charles A. Wallace.
Methuen,	Edwin J. Castle.

* Deceased.

Middleborough,	James A. Burgess.
Middlefield,	John T. Bryan.
Middleton,	Andrew W. Peabody.
Milford,	Waldo Phipps.
Millbury,	Henry W. Carter.
Millis,	Moses C. Adams.
Milton,	James Spencer.
Monroe,	A. H. Goldthwait.
Monson,	William H. Bugbee.
Monson,	Hiram D. Osborne.
Montague,	G. H. Goddard.
Montague,	F. H. Giles.
Monterey,	Lewis H. Mallory.
Montgomery,	Willis B. Cushman.
Mount Washington,	Alfred I. Spurr.
Nahant,	Robert L. Cochran.
Nantucket,	Albert Easton.
Natick,	Walter P. Mayo.
Needham,	Samuel O. Fowle.
New Ashford,	Van Ness Mallery.
New Bedford,	Daniel C. Ashley.
New Braintree,	Charles A. Felton.
New Marlborough,	George A. Stevens.
New Marlborough,	Lorin P. Keyes.
New Salem,	Willard Putnam.
Newbury,	Asa Pingree.
Newburyport,	George W. Knight.
Newton,	James R. McLaughlin.
Norfolk,	Andrew R. Jones.
North Adams,	Angus A. McDonnell.
North Andover,	George S. Fuller.
North Attleborough,	W. Henry Kling.
North Attleborough,	G. B. Draper.
North Attleborough,	Asa A. Newell.
North Brookfield,	B. F. Barnes.
North Brookfield,	Alfred O. Boyd.
North Reading,	F. Howard Mosman.
Northampton,	John H. Roberts.
Northborough,	Allyn D. Phelps.
Northbridge,	George F. Nilsson.
Northbridge,	R. H. Baton.
Northbridge,	W. A. Beane.
Northbridge,	John Lincoln.
Northfield,	R. C. Ward.
Norton,	Oren E. Walker.
Norton,	Lester D. Blandin.
Norwell,	J. Warren Foster.
Norwell,	Edwin C. Briggs.
Norwell,	Ashburton W. Pinson.

Norwood,	.	.	.	.	Albert Fales.
Oakham,	.	.	.	.	Henry P. Austin.
Orange,	.	.	.	.	Amos Blodgett.
Orleans,	.	.	.	.	Edmund Linnell.
Otis,	.	.	.	.	Edwin L. Downs.
Otis,	.	.	.	.	Alfred D. Jones.
Oxford,	.	.	.	.	Fred L. Snow.
Oxford,	.	.	.	.	Willis Rosebrooks.
Palmer,	.	.	.	.	Charles F. Smith.
Palmer,	.	.	.	.	E. W. Phinney.
Paxton,	.	.	.	.	Hiram P. Bemis.
Peabody,	.	.	.	.	Charles Davis.
Peabody,	.	.	.	.	Cyrus T. Batchelder.
Peabody,	.	.	.	.	John E. Herrick.
Pelham,	.	.	.	.	John A. Page.
Pembroke,	.	.	.	.	Clifford I. Rogers.
Pepperell,	.	.	.	.	Samuel P. Bancroft.
Peru,	.	.	.	.	Henry Barlow.
Petersham,	.	.	.	.	S. C. Goddard.
Phillipston,	.	.	.	.	Robert E. McLane.
Pittsfield,	.	.	.	.	George N. Kinnell.
Plainfield,	.	.	.	.	Daniel H. Gould.
Plainfield,	.	.	.	.	Edwin A. Atkins.
Plymouth,	.	.	.	.	Clark Finney, Jr.
Plympton,	.	.	.	.	Howard O. Bonney.
Prescott,	.	.	.	.	Elmer M. Aiken.
Prescott,	.	.	.	.	James D. Barnes.
Prescott,	.	.	.	.	Mason W. Haskins.
Princeton,	.	.	.	.	George Mason, Jr.
Provincetown,	.	.	.	.	Daniel F. Lewis.
Quincy,	.	.	.	.	Charles H. Johnson.
Randolph,	.	.	.	.	Augustus L. Chase.
Raynham,	.	.	.	.	Cyrus Leonard, 2d.
Reading,	.	.	.	.	Milton D. Parker.
Rehoboth,	.	.	.	.	Clarence J. Kingsbury.
Rehoboth,	.	.	.	.	Albert R. Lewis.
Rehoboth,	.	.	.	.	John W. Chase.
Revere,	.	.	.	.	Edwin S. Plaisted.
Richmond,	.	.	.	.	W. H. Branch.
Rochester,	.	.	.	.	Allen G. Ashley.
Rockland,	.	.	.	.	Charles Winslow.
Rockport,	.	.	.	.	Alvin Sanborn.
Rowe,	.	.	.	.	E. M. Upton.
Rowley,	.	.	.	.	Daniel H. Hale.
Rowley,	.	.	.	.	J. Scott Todd.
Royalston,	.	.	.	.	George E. Peirce.
Russell,	.	.	.	.	Sidney S. Shurtleff.
Rutland,	.	.	.	.	F. G. Bartlett.
Salem,	.	.	.	.	Fred Saunders.

Salisbury,	N. T. Getchell.
Sandisfield,	Henry S. Manley.
Sandisfield,	Charles H. Callender.
Sandisfield,	Hiram Bliss.
Sandwich,	Samuel H. Nye.
Saugus,	A. W. Sawyer.
Savoy,	L. E. Perry.
Savoy,	Milton A. Bliss.
Scituate,	Caleb L. Damon.
Seekonk,	Lowell M. Cole.
Seekonk,	Robert Woodward.
Seekonk,	Olney Greene.
Sharon,	A. W. Draper.
Sharon,	George Richards.
Sheffield,	Henry Clark.
Sheffield,	Edwin L. Boardman.
Shelburne,	William M. Bardwell.
Shelburne,	B. F. Maxwell.
Shelburne,	T. R. Shearer.
Sherborn,	Jasper J. Smart.
Shirley,	Samuel B. Scott.
Shrewsbury,	David Barnes.
Shutesbury,	Oscar H. Shaw.
Somerset,	Thomas A. Francis.
Somerville,	Charles M. Berry.
South Hadley,	Horace W. Gaylord.
Southampton,	Henry E. Coleman.
Southampton,	Michael Norris.
Southborough,	William H. Buck.
Southbridge,	Henry A. Morse.
Southbridge,	Francis H. Olin.
Southwick,	Charles W. Talmadge.
Spencer,	Ahraham Capen.
Springfield,	James Kimball.
Sterling,	William S. Walker.
Stockbridge,	John M. Buck.
Stockbridge,	Marshall S. Heath.
Stoneham,	George H. Allen.
Stoughton,	James Murphy.
Stow,	Lewis Parks.
Sturbridge,	William Whittemore.
Sudbury,	George A. Haynes.
Sudbury,	Hiram Haynes.
Sunderland,	George P. Smith.
Sutton,	Edward A. Welch.*
Sutton,	P. D. King.
Swampscott,	Samuel A. Spaulding.†
Swampscott,	George Newhall.

* Deceased.

† Resigned.

Swanzey,	Arthur W. Weaver.
Swanzey,	David B. Gardner.
Swanzey,	Anson L. Barney.
Taunton,	Walter H. Haskell.
Templeton,	S. E. Greenwood.
Templeton,	W. F. Robie.
Tewksbury,	George W. Trull.
Tisbury,	Henry C. Norton.
Tolland,	Oliver E. Slocum, Jr.
Topsfield,	E. L. Wildes.
Topsfield,	Benjamin A. Orne.
Townsend,	John N. Going.
Truro,	John G. Thompson.
Tyngsborough,	Henry J. Keyes.
Tyringham,	Joseph Jones.
Upton,	Benjamin A. Jourdan.
Upton,	George D. Whitney.
Uxbridge,	Charles E. Seagraves.
Wakefield,	Henry C. Perry.
Wales,	Warren W. Eager.
Walpole,	George S. Fuller.*
Walpole,	Isaac Miller.
Waltham,	William E. Peterson.
Ware,	A. A. Etienne.
Wareham,	Prince H. Swift.
Warren,	Marcus Burroughs.
Warwick,	Gilbert Maynard.
Washington,	Charles E. Shultz.
Watertown,	George W. Pope.
Wayland,	Thomas Bryant.
Webster,	George F. Hart.
Wellesley,	Samuel O. Fowle.
Wellfleet,	George W. Nickerson.
Wendell,	G. A. Lewis.
Wenham,	Henry Alley.
West Boylston,	John F. Knights.
West Bridgewater,	David R. Simmons.
West Brookfield,	Charles E. Smith.
West Newbury,	Alfred L. Moore.
West Springfield,	Henry A. Sibley.
West Springfield,	Ethan Brooks.†
West Springfield,	M. H. Bidwell.
West Stockbridge,	Ralph R. Bissell.
West Tisbury,	William B. Luce.
Westborough,	Henry A. Gilmore.
Westfield,	Michael F. Hoar.
Westford,	George T. Day.
Westford,	Albert P. Richardson.

* Deceased.

† Declined.

Westhampton,	William J. Lyman.
Westhampton,	A. D. Montague, Jr.
Westminster,	M. D. Whitney.
Westminster,	Edward P. Miller.
Weston,	Gilbert W. Blood.
Weston,	Everett O. Clark.
Westport,	Edward S. Smith.
Westport,	Theodore B. Pierce.
Westwood,	Creighton Colburn.
Weymouth,	Hiram E. Raymond.
Weymouth,	Charles E. Bicknell.
Whately,	Irving Allis.
Whitman,	Owen F. Bumpus.
Wilbraham,	Lyman A. Fisk.
Williamsburg,	George W. Lawley.*
Williamsburg,	Hallock H. Nichols.
Williamstown,	Joseph B. Hill.
Wilmington,	H. Allen Sheldon.
Winchendon,	William A. Deland.
Winchester,	William B. Simonds.
Windsor,	Gardner L. Miner.
Windsor,	H. Ward Ford.
Winthrop,	John McNaught.
Woburn,	James N. Stuart.
Worcester,	J. Warren Ellsworth.
Worcester,	Thomas Monahan.
Worcester,	John P. Streeter.
Worthington,	Horace F. Bartlett.
Wrentham,	Elisha M. Brastow.
Wrentham,	George B. Ware.
Yarmouth,	Isaiah Homer.
Yarmouth,	James Lack.
Yarmouth,	Isaiah Crowell.

It had previously been the custom of the Board to order the inspectors to make the regular inspection in the fall of the year. This had been found unsatisfactory, as in a great many instances it is the custom for the owners to leave their cattle out until late in the fall, and it frequently happened that at the time of the inspection all the animals had not been taken up from pasture. Because of this, the Board did not think it possible that the work could be done by the inspectors without passing over many animals; but, as the Legislature did not grant the appropriation until late in the season, it had been found impossible to make a change.

* Resigned.

During the past year, however, the Board was granted the appropriation much earlier, and in consequence of this they were enabled to change the time of inspection from fall to spring. As a result of this change they were able to make a more thorough inspection at a time when such animals as were affected would be apt to show the effects of their winter's confinement, and when it was also possible to find them all on the owner's premises. Consequently, on March 9 the following letter was sent to each inspector, instructing him to make an immediate general inspection of the animals within the limits of his district:—

COMMONWEALTH OF MASSACHUSETTS.

BOARD OF CATTLE COMMISSIONERS,
COMMONWEALTH BUILDING, BOSTON, March 9, 1897.

DEAR SIR:—Section 4, chapter 491 of the Acts of 1894, as amended by section 1, chapter 496 of the Acts of 1895, provides that “inspectors shall make regular and thorough inspections of all neat cattle, sheep and swine found within the limits of their several cities and towns. Such inspection shall be made at such times and in such manner as the Board of Cattle Commissioners shall from time to time determine and direct.” This section also provides that “inspectors shall immediately inspect all domestic animals, and any barn, stable or premises where such animals are kept, whenever directed to do so by the Board of Cattle Commissioners.”

Believing that a complete general inspection made at this time would be more satisfactory than one made in the fall, when many animals might be still in pasture, and in accordance with the above authority conferred on us, the Board of Cattle Commissioners hereby order an immediate inspection of all neat cattle, sheep and swine, and all barns, stables and premises where such animals are kept in their several districts. Such inspection is to begin at this date and to be carried on with all possible despatch until finished, or until the first day of May, 1897, when such inspection is hereby ordered closed. The returns of this inspection will be made on the blank form provided, and such returns must be sent to this office each week until completed.

It is further recommended that inspectors ascertain the whereabouts of a number of cattle which they think should be quarantined, and then serve a number of quarantine orders on one day, so as to send us several quarantines at one time, rather than one

or two a day, extended over a period of two or three weeks, as it is much less expensive to send an agent to test a number of animals at one time than it is to send the same agent a number of times to test the same lot of animals.

We also call the notice of inspectors to the regulations for cleansing and disinfecting, which they must see are strictly carried out by the owners or occupants of all premises from which cattle are removed by order of the Board of Cattle Commissioners.

Specimens to be examined, dogs to be tested for the diagnosis of rabies, and the like, are hereafter to be sent by express to Dr. Langdon Frothingham, Harvard Medical School, 688 Boylston Street, Boston, Mass. In every case the name and address of the owner of the animal, with the history of the case, should be enclosed with the specimen.

Yours truly,

AUSTIN PETERS, *Chairman*.

The work of the inspectors having been ordered completed by May 1, the following letter, dated May 12, was sent to those inspectors who had not brought their work to a close :—

COMMONWEALTH OF MASSACHUSETTS.

BOARD OF CATTLE COMMISSIONERS,
BOSTON, MASS., May 12, 1897.

To the Town Inspector of Cattle.

SIR :— We desire to call your attention to our letter of March 9, ordering an inspection of cattle to be completed May 1.

In towns where the inspection was completed on this date, we wish to thank the inspectors for their promptness; where such inspection is not completed, we wish it brought to a close without further delay. No more cattle are to be quarantined until another inspection is ordered, unless some one reports a badly diseased creature to the Board of Health.

The inspectors of border towns are also requested to bear in mind the provisions of General Order No. 9, requiring that cattle brought in from without the State, which have not already been tested with tuberculin in a manner satisfactory to the Board of Cattle Commissioners, are to be held in quarantine at the expense of the owner until tested with tuberculin at his expense by a veterinarian acceptable to this Board.

Per order Massachusetts Board of Cattle Commissioners,

AUSTIN PETERS, *Chairman*.

This letter was sent out for the purpose of stopping the *general inspection*; but, while it was intended to close this

inspection, it was of course still possible for the inspector to quarantine such animals as were reported in writing as diseased to the local board of health, and this class of work has gone on all summer.

The following table gives the number of cattle assessed in each town, the total number of cattle tested, and the number condemned and paid for during the year, as well as the State tax for each town in the Commonwealth:—

CITY OR TOWN.	Neat Cattle Assessed.	Number Tested.	Number Paid for.	Amount Paid.	State Tax.
Abington,	254	14	5	\$153 00	\$1,750 00
Acton,	1,175	144	127	4,751 50	1,050 00
Acushnet,	449	9	3	75 00	437 50
Adams,	689	18	2	75 00	2,695 00
Agawam,	2,315	17	17	395 00	945 00
Alford,	275	7	4	125 00	157 50
Amesbury,	381	39	25	727 50	3,657 50
Amherst,	1,696	34	18	431 25	2,222 50
Andover,	913	87	50	1,980 00	3,430 00
Arlington,	257	12	—	—	5,653 00
Ashburnham,	431	34	25	764 75	752 50
Ashfield,	1,269	7	5	190 00	367 50
Ashby,	570	60	36	1,128 00	367 50
Ashland,	309	23	16	516 50	857 50
Athol,	514	16	5	205 00	2,642 50
Attleborough,	776	36	24	654 00	3,220 00
Avon,	109	1	—	—	542 50
Ayer,	113	1	1	7 00	962 50
Auburn,	826	1	2	60 00	402 50
Barnstable,	584	4	2	13 00	2,695 00
Barre,	1,995	58	30	924 50	1,032 50
Becket,	642	—	—	—	332 50
Bedford,	627	21	17	495 00	682 50
Belchertown,	1,959	18	9	227 00	630 00
Bellingham,	524	37	19	584 50	490 00
Belmont,	215	7	2	38 00	2,642 50
Berkley,	403	—	—	—	315 00
Berlin,	555	9	5	137 50	350 00
Bernardston,	797	15	10	287 50	297 50
Beverly,	595	4	2	50 00	10,132 50
Billerica,	809	195	133	5,677 51	1,382 50
Blackstone,	351	—	—	—	1,890 00
Blandford,	955	26	9	243 00	312 00
Bolton,	758	54	46	1,353 00	332 50
Boston,	400	288	98	3,557 99	628,740 00
Bourne,	174	—	—	—	172 50
Boxborough,	532	52	42	1,418 00	157 50
Boylston,	741	6	3	75 00	350 00
Boxford,	555	19	16	457 50	437 50
Braintree,	404	—	—	—	3,115 00
Brewster,	188	—	—	—	437 50
Bridgewater,	464	10	4	185 00	1,767 50
Brimfield,	1,033	24	20	581 50	297 50
Brockton,	696	55	29	1,012 25	15,085 00
Brookfield,	803	1	1	5 00	1,050 00
Brookline,	361	5	3	115 00	41,632 50
Buckland,	736	2	2	55 00	420 00
Burlington,	478	8	6	210 00	350 00
Cambridge,	262	1	1	30 00	54,600 00

CITY OR TOWN.	Neat Cattle Assessed.	Number Tested.	Number Paid for.	Amount Paid.	State Tax.
Canton,	374	9	7	\$267 00	\$3,027 50
Carlisle,	513	326	195	8,700 00	245 00
Carver,	164	—	—	—	577 00
Charlemont,	732	13	4	73 50	280 00
Charlton,	1,595	30	24	682 00	682 50
Chatham,	177	—	—	—	665 00
Chelmsford,	1,100	209	136	4,769 00	1,452 50
Chelsea,	82	2	—	—	15,802 50
Cheshire,	998	4	2	27 00	525 00
Chester,	650	1	1	20 00	455 00
Chesterfield,	696	18	8	269 00	210 00
Chicopee,	594	16	10	312 00	5,810 00
Chilmark,	152	—	—	—	157 50
Clarksburg,	355	—	—	—	175 00
Clinton,	150	—	—	—	4,865 00
Cohasset,	297	—	—	—	3,360 00
Colrain,	1,317	49	7	163 00	420 00
Concord,	1,428	129	98	3,170 00	2,940 00
Conway,	1,293	79	48	1,426 00	507 50
Cottage City,	111	—	—	—	980 00
Cummington,	645	47	26	894 50	227 50
Dalton,	448	11	2	75 00	2,047 50
Dana,	250	1	—	—	210 00
Danvers,	745	27	23	922 00	3,150 00
Dartmouth,	1,752	3	3	60 00	1,890 00
Dedham,	486	42	25	722 50	4,602 50
Deerfield,	1,231	78	29	882 00	1,155 00
Dennis,	198	—	—	—	1,172 50
Dighton,	360	5	4	95 00	595 00
Douglas,	334	4	1	20 00	735 00
Dover,	622	21	12	350 00	682 00
Dracut,	950	163	155	5,899 00	1,172 50
Dudley,	906	15	12	276 00	787 50
Dunstable,	661	13	7	190 50	210 00
Duxbury,	290	8	1	15 00	1,102 50
East Bridgewater,	531	19	8	212 00	1,155 00
East Longmeadow,	525	6	3	63 00	490 00
Eastham,	181	—	—	—	210 00
Easthampton,	741	9	5	132 50	1,750 00
Easton,	659	7	4	90 00	3,552 50
Edgartown,	324	—	—	—	525 00
Egremont,	851	14	7	244 00	332 50
Enfield,	514	1	—	—	560 00
Erving,	170	—	—	—	280 00
Essex,	487	—	—	—	700 00
Everett,	133	8	—	—	8,610 00
Fairhaven,	440	—	—	—	1,382 50
Fall River,	591	14	4	62 50	43,540 00
Falmouth,	422	3	—	—	4,287 50
Fitchburg,	761	32	24	800 00	13,860 00
Florida,	358	—	—	—	122 50
Foxborough,	361	14	4	85 00	1,190 00
Framingham,	1,056	60	36	1,387 00	6,527 50
Franklin,	701	40	21	549 00	2,100 00
Freetown,	591	4	—	—	630 00
Gardner,	461	212	86	3,221 50	3,552 50
Gay Head,	56	—	—	—	17 50
Georgetown,	276	—	—	—	752 50
Gill,	678	35	12	374 00	332 50
Gloucester,	550	2	—	—	11,375 00
Goshen,	382	3	1	23 00	105 00
Gosnold,	51	—	—	—	140 00
Grafton,	1,118	79	34	1,134 50	1,732 50
Granby,	1,296	63	41	1,031 50	332 50
Granville,	661	15	—	—	262 50
Great Barrington,	1,517	10	5	115 00	2,572 50
Greenfield,	1,084	108	61	2,102 50	3,727 50

CITY OR TOWN.	Neat Cattle Assessed.	Number Tested.	Number Paid for.	Amount Paid.	State Tax.
Greenwich,	341	12	6	\$173 00	\$192 50
Groton,	993	45	33	1,068 50	2,047 50
Groveland,	226	2	1	40 00	700 00
Hadley,	1,484	18	9	178 00	735 00
Halifax,	149	1	1	15 00	192 50
Hamilton,	372	1	-	-	752 50
Hampden,	601	11	3	75 00	280 00
Hancock,	604	8	2	60 00	245 00
Hanover,	286	3	-	-	1,015 00
Hanson,	164	2	1	39 00	455 00
Hardwick,	1,887	86	40	1,159 00	1,085 00
Harvard,	1,316	105	66	2,228 50	717 50
Harwich,	189	-	-	-	875 00
Hatfield,	439	3	2	43 00	735 00
Haverhill,	894	76	42	1,374 00	14,735 00
Hawley,	576	-	1	22 50	122 50
Heath,	722	25	9	234 00	140 00
Hingham,	506	1	-	-	3,167 50
Hinsdale,	695	-	-	-	542 50
Holden,	694	-	-	-	845 00
Holbrook,	147	-	-	-	945 00
Holland,	131	14	9	233 50	70 00
Holliston,	708	7	5	164 00	1,207 50
Holyoke,	602	18	5	185 00	19,040 00
Hopedale,	106	10	4	152 00	1,820 00
Hopkinton,	735	51	31	1,107 50	1,470 00
Hubbardston,	933	32	19	609 50	490 00
Hudson,	735	14	8	330 00	2,082 50
Hull,	79	1	1	40 00	1,820 00
Huntington,	517	21	4	122 50	385 00
Hyde Park,	116	6	2	55 00	5,932 50
Ipswich,	935	6	9	202 00	2,065 00
Kingston,	205	5	2	38 00	1,172 50
Lakeville,	376	7	4	98 00	402 50
Lancaster,	622	41	24	816 00	2,082 50
Lanesborough,	870	48	41	1,320 00	367 50
Lawrence,	169	20	13	535 00	23,240 00
Lee,	721	90	3	70 00	1,295 00
Leicester,	536	3	3	80 00	1,645 00
Lenox,	638	39	20	600 00	2,082 50
Leominster,	723	96	69	2,431 00	3,990 00
Leverett,	455	1	-	-	210 00
Lexington,	1,044	119	106	4,067 50	2,052 50
Leyden,	470	36	7	204 64	122 50
Lincoln,	775	123	95	3,599 00	1,610 00
Littleton,	1,223	70	35	1,217 00	612 50
Longmeadow,	281	21	18	494 00	437 50
Lowell,	280	43	32	1,448 50	49,000 00
Ludlow,	1,039	30	18	493 00	752 50
Lunenburg,	633	54	31	847 00	560 00
Lynn,	227	53	4	117 00	34,667 00
Lynnfield,	287	18	1	8 00	420 00
Malden,	161	-	-	-	17,307 00
Manchester,	86	-	-	-	4,970 00
Mansfield,	226	5	-	-	1,277 50
Marblehead,	294	4	3	73 00	4,042 50
Marion,	146	-	-	-	577 50
Marlborough,	841	17	15	652 00	5,792 50
Marshfield,	530	38	14	420 50	945 00
Mashpee,	36	-	-	-	122 50
Mattapoisett,	225	2	2	45 00	1,050 00
Maynard,	229	106	102	3,987 50	1,470 00
Medfield,	508	2	2	95 00	997 50
Medford,	303	1	2	45 00	10,902 50
Medway,	435	9	6	175 00	927 50
Melrose,	222	1	1	40 00	6,877 50
Mendon,	567	12	8	161 00	385 00

CITY OR TOWN.	Neat Cattle Assessed	Number Tested.	Number Paid for.	Amount Paid.	State Tax.
Merrimac,	281	6	2	\$25 00	\$945 00
Methuen,	1,347	67	40	1,311 00	2,467 50
Middleborough,	664	15	11	375 00	2,975 00
Middlefield,	469	1	—	—	175 00
Middleton,	246	12	6	133 00	367 50
Milford,	405	5	2	75 00	3,867 50
Millbury,	730	15	10	289 50	1,680 00
Millis,	509	3	3	100 00	595 00
Milton,	871	4	2	27 00	13,737 50
Monroe,	155	—	—	—	105 00
Monson,	1,280	13	7	180 00	1,400 00
Montague,	777	59	7	232 50	2,555 00
Monterey,	536	2	—	—	175 00
Montgomery,	356	—	—	—	105 00
Mount Washington,	78	—	—	—	52 50
Nahant,	44	—	—	—	4,042 50
Nantucket,	512	—	—	—	2,117 50
Natick,	498	56	45	1,726 50	3,990 00
Needham,	638	9	6	172 75	1,977 50
New Ashford,	134	—	—	—	52 50
New Bedford,	581	2	1	50 00	36,067 50
New Braintree,	1,315	17	9	162 00	297 50
New Marlborough,	134	17	5	104 00	402 50
New Salem,	369	4	2	45 50	227 50
Newbury,	1,078	1	1	30 00	752 50
Newburyport,	249	43	43	1,378 00	7,867 50
Newton,	1,176	510	35	1,189 00	32,077 50
Norfolk,	344	32	21	795 00	367 50
North Adams,	1,611	—	—	—	5,477 50
North Andover,	1,286	119	89	3,289 00	2,363 50
North Attleborough,	591	30	24	692 50	2,800 00
North Brookfield,	954	20	10	256 50	1,400 00
North Reading,	293	32	23	815 00	367 50
Northampton,	966	49	8	228 49	7,315 00
Northborough,	803	61	28	745 00	892 50
Northbridge,	495	12	4	98 00	2,537 50
Northfield,	1,056	2	—	—	682 50
Norton,	352	3	1	40 00	577 50
Norwell,	255	5	4	70 00	670 00
Norwood,	372	15	10	367 00	2,152 50
Oakham,	641	16	10	231 50	245 00
Orange,	795	35	19	546 00	2,817 50
Orleans,	168	1	—	—	490 00
Otis,	604	—	—	—	157 50
Oxford,	569	9	4	105 00	927 50
Palmer,	789	12	8	235 00	2,030 00
Paxton,	396	6	5	70 50	192 50
Peabody,	658	52	26	1,185 00	5,477 50
Pelham,	215	2	1	25 00	122 50
Pembroke,	166	8	1	18 00	472 50
Pepperell,	813	83	19	559 00	1,435 00
Peru,	353	10	1	25 00	87 50
Petersham,	612	31	10	267 50	455 00
Phillipston,	351	35	6	127 00	210 00
Pittsfield,	1,155	49	10	322 00	9,415 00
Plainfield,	565	3	2	47 00	122 50
Plymouth,	401	12	6	157 50	4,620 00
Plympton,	109	—	—	—	227 50
Prescott,	399	3	2	17 50	122 50
Princeton,	1,240	155	85	2,953 00	577 50
Provincetown,	61	—	—	—	1,592 50
Quincy,	642	6	3	100 00	11,777 50
Randolph,	192	—	—	—	1,645 00
Ravnnham,	407	10	7	185 00	630 00
Reading,	409	4	1	35 00	2,450 00
Rehoboth,	1,269	25	12	327 50	525 00
Revere,	119	—	—	—	4,585 00

CITY OR TOWN.	Neat Cattle Assessed.	Number Tested.	Number Paid for.	Amount Paid.	State Tax.
Richmond,	448	-	-	-	\$245 00
Rochester,	295	4	-	-	385 00
Rockland,	209	1	-	-	2,170 00
Rockport,	145	-	-	-	1,845 00
Rowe,	409	-	-	-	175 00
Rowley,	483	3	3	\$90 00	490 00
Royalston,	619	39	24	732 00	437 50
Russell,	148	24	15	539 00	350 00
Rutland,	848	60	38	942 00	367 50
Salisbury,	421	23	5	145 00	465 00
Salem,	327	16	13	389 50	20,475 00
Sandisfield,	766	43	18	577 00	245 00
Sandwich,	214	11	3	80 00	682 50
Sangus,	656	-	-	-	2,065 00
Savoy,	592	19	2	41 00	122 50
Scituate,	345	1	-	-	1,435 00
Seekonk,	1,019	23	12	324 00	612 50
Sharon,	338	18	13	405 00	1,137 50
Sheffield,	592	8	2	61 00	630 00
Shelburne,	1,210	26	2	60 00	647 50
Shutesbury,	130	-	-	-	122 50
Sherborn,	742	16	15	449 50	577 50
Shirley,	409	13	6	119 00	525 00
Shrewsbury,	1,267	2	1	26 00	700 00
Somerset,	387	2	1	20 00	752 50
Somerville,	200	9	2	50 00	30,205 00
South Hadley,	1,070	20	3	80 00	1,645 00
Southampton,	1,027	10	9	260 00	350 00
Southborough,	1,085	33	24	686 00	1,137 50
Southbridge,	786	26	21	856 50	2,852 50
Southwick,	802	1	1	12 50	385 00
Spencer,	1,089	27	22	560 00	2,922 50
Springfield,	400	28	13	462 50	41,072 50
Sterling,	1,491	94	61	1,661 66	612 50
Stockbridge,	1,671	28	20	697 00	2,170 00
Stoneham,	233	8	8	308 00	2,835 00
Stoughton,	368	2	2	55 00	2,117 50
Stow,	857	107	86	2,858 00	455 00
Sturbridge,	770	14	4	92 00	682 50
Sudbury,	1,075	361	353	14,328 58	822 50
Sunderland,	775	60	17	558 00	297 50
Sutton,	962	75	45	1,418 50	945 00
Swampscott,	79	28	10	376 50	3,955 00
Swansey,	926	1	-	-	612 50
Taunton,	762	8	-	-	13,965 00
Templeton,	506	52	14	469 50	980 00
Tewksbury,	531	87	17	615 00	1,050 00
Tisbury,	33	-	-	-	577 50
Tolland,	426	4	-	-	105 00
Topsfield,	684	17	13	515 00	612 50
Townsend,	418	27	13	384 50	840 00
Truro,	195	-	-	-	262 50
Tyngsborough,	415	28	20	701 00	280 00
Tyringham,	801	7	1	28 00	157 50
Upton,	548	4	3	87 00	735 00
Uxbridge,	712	19	6	180 00	1,592 50
Wakefield,	270	1	1	35 00	4,095 00
Wales,	250	2	-	-	210 00
Walpole,	523	12	9	317 50	1,452 50
Waltham,	770	77	70	2,614 50	13,055 00
Ware,	941	14	7	144 00	3,097 50
Wareham,	191	1	-	-	1,170 00
Warren,	1,422	19	7	167 50	1,960 00
Warwick,	275	5	1	14 00	227 50
Washington,	518	5	3	125 00	140 00
Watertown,	247	23	7	262 00	5,705 00
Wayland,	784	85	63	2,259 50	1,102 50

CITY OR TOWN.	Neat Cattle Assessed.	Number Tested.	Number Paid for.	Amount Paid.	State Tax.
Webster,	262	3	—	—	\$2,695 00
Wellesley,	289	6	6	\$209 50	4,655 00
Wellfleet,	98	—	—	—	542 50
Wendell,	188	—	—	—	175 00
Wenham,	398	1	—	—	472 50
West Boylston,	682	5	4	131 00	962 50
West Bridgewater,	759	47	21	917 50	700 00
West Brookfield,	1,025	41	28	718 50	595 00
West Newbury,	852	24	7	239 00	700 00
West Springfield,	695	27	12	392 50	2,887 50
West Stockbridge,	605	7	1	15 00	402 50
West Tisbury,	230	—	—	—	280 00
Westborough,	1,222	133	71	2,227 00	1,960 00
Westfield,	1,135	6	—	—	5,547 50
Westford,	809	44	39	1,209 30	962 50
Westhampton,	524	6	—	—	175 00
Westminster,	666	64	32	1,018 50	542 50
Weston,	914	102	95	3,243 50	2,502 50
Westport,	1,167	85	52	1,557 00	1,102 50
Westwood,	591	9	6	146 00	—
Weymouth,	529	2	—	—	4,777 50
Whately,	730	25	16	433 00	332 50
Whitman,	302	15	4	107 00	2,555 00
Wilbraham,	709	12	4	155 00	595 00
Williamsburg,	693	88	2	42 00	665 00
Williamstown,	1,380	—	—	—	1,767 50
Wilmington,	240	28	19	479 35	630 00
Winchendon,	476	10	5	121 00	1,545 00
Winchester,	176	—	—	—	4,532 50
Windsor,	752	14	2	57 00	140 00
Winthrop,	302	3	—	—	3,045 00
Woburn,	336	23	15	487 00	6,795 00
Worcester,	1,888	126	75	2,648 49	63,507 50
Worthington,	914	41	6	177 50	227 50
Wrentham,	483	24	18	654 50	1,067 50
Yarmouth,	140	—	—	—	1,470 00
Total,	210,801	9,991	5,435*	\$185,448 56*	\$1,750,000 00

The foregoing table does not include 254 animals which have been condemned, and warrants for which are now in the process of settlement. The estimated amount due for condemned cattle not paid for, and other outstanding bills, amount to \$10,712.40.

The financial statement is as follows :—

Number cattle paid for as tuberculous, 5,275 ; amount paid,	\$179,867 52
Number cattle paid for, no lesions found, 160 ; amount paid,	5,581 04
Quarantine expenses ; amount paid,	2,928 11
Arbitration, amount paid,	27 75
Killing and burial expenses, amount paid,	125 93

Average per head for 5,435 cattle, \$34.12 ; total amount paid, \$188,530 35

Amount carried forward, \$188,530 35

* These figures include 185 animals paid for in 1897 but quarantined and condemned in 1896.

<i>Amount brought forward,</i>		\$188,530 35
Amount paid for commissioners' salaries,	\$7,283 00	
Amount paid for agents' salaries,	13,561 54	
Amount paid for clerks' and stenographers' salaries,	5,201 04	
Expenses of commissioners,	3,781 80	
Expenses of agents,	11,869 28	
Expenses of office,	3,154 56	
Expenses of laboratory and experimental work,	1,515 17	
Expenses of implements,	1,883 75	
Expenses of quarantine stations,	3,870 35	
Expenses of glanders (killing and burial),	87 00	
		<hr/> 52,207 49
Total payments,		<hr/> \$240,737 84

During the year the average price per head has been	\$34 12
For the first six months the average price per head has been	35 22
For the last six months the average price per head has been	30 45
For the last three months the average price per head has been	28 26
For the last one month the average price per head has been	29 69

The high average for the first six months and for the year is due in a great measure to the number of private tests that were made during the early months of the year.

Cash received during the year and turned over to the State Treasurer: —

For hides and carcasses,	\$5,039 74
For sale of laboratory supplies,	76 09
For sale of pasture tags,	100 41
For use of telephone,	1 05
Total,	<hr/> \$5,217 29

In the work of inspecting the cattle in their respective towns the inspectors are supposed to make a physical examination of each animal on the premises. Any that they have reason to suspect as being diseased are placed in quarantine, to be examined later by the Cattle Commission, and either released or condemned, as may be decided. This work has gradually resulted in the advanced generalized cases of tuberculosis being picked out by the inspectors and destroyed,

until finally, as will be seen by an examination of the reports of the autopsies on the cattle killed, the cases of generalized or advanced cases of tuberculosis have become very scarce.

In the following tables the cases of advanced generalized tuberculosis among the cattle killed in 1897, excluding private test work, are compared with the reports for the years 1895 and 1896:—

Jan. 1 to Dec. 31, 1895.

Number of animals tested,	. . . . .	4,484.
Number of animals condemned and found		
diseased,		2,398, or 53.4 per cent.
General tuberculosis,		784, or 32.6 per cent.

Jan. 1 to Dec. 31, 1896.

Number of animals tested,	7,062.
Number of animals condemned and found	
diseased,	4,173, or 59.0 per cent.
General tuberculosis,	1,051, or 25.1 per cent.

Jan. 1 to Dec. 23, 1897.

Total number of animals tested to Dec. 23,	
1897,	9,844.
Total number of animals condemned to Dec.	
23, 1897,	5,062, or 51.43 per cent.
General tuberculosis to Dec. 23, 1897,	183, or 3.61 per cent.

It will be seen that these cases of advanced generalized tuberculosis have become very scarce, and these figures illustrate well the practical benefits resulting from this work.

In isolated cases or in out-of-the-way places the post-mortem examinations are often made by local inspectors. It is not unusual that they have had but little special training in this work, and their opinion as to whether the disease is generalized or not is not always reliable. As a check, therefore, on their averages, the following table was prepared from those cases where the autopsies were made at Brighton, or by reliable veterinarians; and it will be noticed that,

while the percentage is higher, yet it is close enough to confirm the averages for the year : —

Jan. 1 to Dec. 23, 1897.

Number of animals condemned and found diseased, the autopsies being made at Brighton	
or by reliable veterinarians,	3,590.
General tuberculosis,	177, or 4.37 per cent.

The law further provides, in section 29, chapter 491 of the Acts of 1894, that “ Every person, except the members of the Board of Cattle Commissioners, who has knowledge of, or has good reason to suspect the existence of, any contagious disease among any species of domestic animal within the limits of this Commonwealth, or that any domestic animal is affected with any such contagious disease, whether such knowledge is obtained by personal examination or otherwise, shall immediately give written notice thereof to the board of health of the city or town where such diseased animal or animals are kept.”

During the early part of this year this section of the law had an important bearing on the work of the Board ; for, immediately on the granting of the appropriation for the continuance of the work, the Board began to be deluged with quarantine papers and letters from veterinarians and others, reporting cattle that had reacted to the tuberculin test applied by veterinarians in private practice.

Under the law, the only thing to be done was either to accept the veterinarian’s test or to retest the herd ; this latter was often found to be unsatisfactory, because of the frequent failure of animals to react to a second test. The result was that to a large extent the control of the appropriation was taken out of the hands of the Board ; the money could not be placed where, in the opinion of the Board, it would do the most good, and they further realized that they had no guarantee from the owners that an honest effort would be made by these owners to get rid of the disease.

In doing voluntary request work and in testing entire herds the Board had always insisted that the owner should

agree to observe the sanitary requirements prescribed by them, introduce none but tested animals into the herd without first having them tested with tuberculin, and thoroughly disinfect the premises. These precautions were considered necessary, because it was thought to be of little use to test an entire herd and kill those that reacted, in the expectation of freeing the herd of disease, if untested or diseased animals were to take the place of those condemned, or if tested animals were to be put into infected stalls or stalls that had not been properly disinfected. This matter had evidently not been thoroughly explained to many of the parties that had their herds tested by private veterinarians; and so, because of this, the following letter was sent to all whose herds had been tested in this manner:—

COMMONWEALTH OF MASSACHUSETTS.

BOARD OF CATTLE COMMISSIONERS,
COMMONWEALTH BUILDING, BOSTON, April, 1897.

DEAR SIR:— We desire to call the attention of owners of cattle, whose herds have been tested by private test, to section 45, chapter 491 of 1894, as amended by section 10, chapter 496 of 1895. This section provides for the killing of animals found to be affected with any contagious disease. It further provides that, “whenever any cattle condemned as afflicted with the disease of tuberculosis are killed under the provision of this section, the full value thereof at the time of condemnation, not exceeding the sum of sixty dollars for any one animal, shall be paid to the owner thereof out of the treasury of the Commonwealth, if such animal has been owned within the State six months continuously prior to its being killed; *provided*, such person shall not have, prior thereto, *in the judgment of the Cattle Commissioners, by wilful act or neglect, contributed to the spread of tuberculosis*; but such decision on the part of the commissioners shall not deprive the owner of the right to arbitrate, as hereinafter provided.”

If an owner does not thoroughly cleanse and disinfect his barn, or if, after having had his herd tested and paid for by the State, he introduces untested animals into his herd, he has through his neglect contributed to the spread of tuberculosis in his herd, and, therefore, under this section forfeits his right to compensation for such tuberculous animals as may hereafter be found in his herd. The commissioners desire to call your attention to this matter, so that you may fully understand their position in regard to it.

You are hereby requested to notify the Board what steps you take toward disinfecting your barn, and the date that the work was completed. Please pay particular attention to this last request.

Yours truly,

AUSTIN PETERS, *Chairman.*

JOHN M. PARKER, *Secretary.*

LEANDER F. HERRICK.

MAURICE O'CONNELL.

C. A. DENNEN.

This was not thought to be sufficient, however, and on the 12th of April an agent was appointed to visit these owners and report on the condition of the barns. In the mean time, because of the amount of private testing that was being done, the Legislature took the matter up, and a committee was appointed to investigate the condition of the cows condemned in certain herds in the neighborhood of Dracut and Lowell. This committee made a special report to the Legislature on the matter; in their report the majority of the committee recommended that "all testing of cattle with tuberculin, when compensation is expected, be limited to the Cattle Commissioners or their authorized agents. The Board of Cattle Commissioners have already expended more than \$160,000 of the total appropriation of \$250,000 made earlier in the session. If they are compelled to kill all reacting animals and allow full compensation for the diseased cattle, the remainder of the appropriation will soon be exhausted. There will then be no money for the prosecution of the regular work of the commission, or the slaughter of those animals reported by the local inspectors as suspicious cases, and which are really the most dangerous animals to the health and comfort of the general public. The commissioners are not allowed to exceed their appropriation, hence all their work must stop when their money gives out."

As a result of this recommendation, the following law was passed and approved June 10, 1897:—

[CHAPTER 499 OF THE ACTS OF 1897.]

SECTION 1. No person having animals tested with tuberculin shall be entitled to compensation from the treasury of the Commonwealth for any animals that react to the tuberculin test, unless

such testing be done by the State Board of Cattle Commissioners, or their authorized agents acting as such at the time of the test, and such testing shall be subject to the supervision and control of the State Board of Cattle Commissioners.

SECT. 2. This act shall take effect upon its passage.

The names of the towns, the number of cattle in each herd and the value and numbers of those condemned previous to the passage of this act are as follows:—

Private Tests reported by Dr. W. E. Peterson.

OWNER.	Town.	Number Tested.	Number Condemned.	Amount.	Per Cent. of Disease.
C. Warren, . . .	Waltham, .	38	2	\$65 00	5.26
P. Brodrick, . . .	" .	28	14	553 00	50.00
C. Viles, . . .	" .	37	34	1,298 00	81.89
School for Feeble-minded Children.	" .	17	1	35 00	5.88
L. H. Bent, . . .	Sudbury, .	30	18	799 00	60.00
W. L. Stone & Son, . .	" .	28	25	1,161 00	89.28
C. L. Noyes, . . .	" .	21	3	101 00	14.28
J. Quinn, . . .	" .	14	8	270 00	57.14
J. Rafuse, . . .	" .	18	14	547 00	77.77
G. A. Haynes, . . .	" .	56	13	574 00	23.21
F. Haynes, . . .	" .	17	5	197 00	29.41
H. M. Noyes, . . .	" .	19	16	637 00	84.21
F. W. Buttrick, . . .	" .	2	1	20 00	50.00
F. E. Bent, . . .	" .	6	3	123 68	50.00
G. Gilman, . . .	" .	5	2	92 00	40.00
F. Rouse, . . .	" .	13	6	218 00	46.15
G. Haynes, . . .	" .	11	4	104 00	36.36
J. Clark, . . .	" .	2	1	30 00	50.00
A. F. Hunt, . . .	" .	9	6	235 00	66.66
A. M. Thompson, . . .	" .	17	7	307 00	41.17
J. E. Bent, . . .	" .	16	12	565 00	75.00
Town Farm, . . .	" .	19	6	214 00	31.57
J. Austin, . . .	" .	17	12	513 00	70.58
F. P. Barton, . . .	" .	15	13	437 00	86.66
P. Maguire, . . .	" .	20	5	184 00	25.00
M. J. Haynes, . . .	" .	26	22	678 00	84.61
L. F. Flood, . . .	" .	18	12	566 00	66.66
J. Dwyer, . . .	" .	14	13	592 00	91.42
F. M. Bowker, . . .	" .	14	10	370 00	71.42
J. S. Rice, . . .	" .	11	7	305 50	63.63
A. Dakin, . . .	" .	10	—	—	—
R. W. Powers, . . .	" .	16	7	275 00	43.75
P. Pilkington, . . .	" .	14	9	331 00	61.28
C. E. Haynes, . . .	" .	14	4	149 00	28.57
L. P. Bent, . . .	" .	11	6	230 00	51.54
H. C. Bowers, . . .	" .	2	2	90 00	100.00
Goodnow Bros., . . .	" .	11	7	252 00	63.63
E. McManus, . . .	" .	6	5	231 00	83.22
G. L. Goodnow, . . .	" .	6	—	—	—
E. Goodnow, . . .	" .	13	7	373 00	53.84
S. D. Perry, . . .	" .	23	22	1,039 00	95.65
T. F. O'Neil, . . .	" .	14	4	191 00	28.57
E. Senett, . . .	" .	4	1	35 00	25.00
C. W. Rice, . . .	" .	28	12	457 00	42.85
J. E. Bent, . . .	Maynard, .	9	1	40 00	11.11
S. G. Brown, . . .	" .	8	7	289 00	87.05
D. Mynahan, . . .	" .	15	2	92 50	13.33

OWNER.	Town.	Number Tested.	Number Condemned.	Amount.	Per Cent. of Disease.
J. H. Sullivan, . . .	Maynard, . . .	23	14	\$595 00	60.86
H. B. Fowler, . . .	" . . .	20	9	367 00	45.00
G. F. Brown, . . .	" . . .	1	1	32 00	100.00
J. F. Parmenter, . . .	" . . .	23	19	784 00	82.06
W. F. Litchfield, . . .	" . . .	3	1	38 00	33.33
C. Brooks, . . .	" . . .	5	5	220 00	100.00
J. A. Johnson, . . .	" . . .	6	6	225 00	100.00
J. H. Vose, . . .	" . . .	12	6	218 00	50.00
E. B. Wilcomb, . . .	" . . .	11	7	218 00	33.33
C. A. Whitney, . . .	" . . .	15	7	248 00	46.66
G. E. Whitney, . . .	" . . .	14	6	220 00	42.84
G. A. Whitney, . . .	" . . .	1	1	32 00	100.00
L. C. Colbert, . . .	" . . .	6	2	75 00	33.33
C. Randall, . . .	" . . .	5	4	170 00	80.00
W. Parmenter, . . .	" . . .	10	1	40 00	10.00
M. W. Hynes, . . .	Wayland, . . .	10	3	140 00	30.00
T. L. Hynes, . . .	" . . .	4	2	85 00	50.00
H. Walker, . . .	" . . .	14	1	40 00	7.14
G. Patterson, . . .	Stow, . . .	16	5	178 00	31.25
H. S. Hapgood, . . .	" . . .	20	14	429 00	70.00
W. H. Lord, . . .	" . . .	12	10	360 00	83.33
B. C. Brown, . . .	" . . .	3	-	-	-
G. W. Bradley, . . .	" . . .	4	3	102 00	75.00
Benj. Clark, . . .	" . . .	8	6	238 00	75.00
A. W. Puffer, . . .	" . . .	4	4	172 00	100.00
A. Tuttle, . . .	" . . .	8	8	263 50	100.00
F. W. Hapgood, . . .	" . . .	2	1	52 00	40.00
W. Toohey, . . .	" . . .	5	2	65 00	-
P. A. Gately, . . .	" . . .	5	-	-	-
J. J. Gately, . . .	" . . .	13	3	108 00	23.07
J. Lund, . . .	" . . .	1	-	-	-
F. Bond, . . .	" . . .	6	-	-	-
J. Johnson, . . .	" . . .	6	2	77 00	33.33
W. C. Robbins, . . .	Acton, . . .	50	33	1,375 00	66.00
C. B. Robbins, . . .	" . . .	24	21	721 00	87.05
A. Cole, . . .	" . . .	18	11	491 00	61.11
J. K. W. Wetherbee, . . .	" . . .	10	8	306 00	80.00
H. D. Clark, . . .	Weston, . . .	13	11	499 00	84.61
F. B. Ripley, . . .	" . . .	10	8	324 00	80.00
L. E. Roberts, . . .	" . . .	18	14	444 00	77.77
G. B. Milton, . . .	" . . .	7	2	63 00	28.56
C. H. Bryden, . . .	" . . .	18	17	620 00	94.44
H. Zoller, . . .	" . . .	42	23	670 00	54.76
A. G. Loker, . . .	" . . .	18	11	354 00	61.11
M. L. Currant, . . .	Lexington, . . .	29	17	746 00	58.60
S. M. Lawrence, . . .	" . . .	35	31	1,249 00	88.57
E. T. Payson, . . .	" . . .	2	2	70 00	100.00
H. E. Barnes, . . .	Lincoln, . . .	15	8	390 00	53.33
R. Sherman, . . .	" . . .	12	1	32 50	8.33
L. Mayer, . . .	" . . .	18	18	831 00	100.00
D. H. Sherman, . . .	" . . .	32	8	347 00	25.00
H. J. Harrington, . . .	" . . .	11	4	157 00	36.36
J. Thompson, . . .	" . . .	8	8	268 00	100.00
G. Miles, . . .	Concord, . . .	23	23	787 00	100.00
C. H. Bryan, . . .	" . . .	7	6	243 00	85.71
J. A. Hager, . . .	Marlborough, . . .	24	12	557 00	50.00

Private Tests reported by Dr. A. J. Sheldon.

R. Fox,	Dracut,	41	30	\$1,245 00	73.17
D. S. Fox,	"	10	8	300 00	80.00
C. E. Jones,	"	15	10	372 00	66.66
F. A. Fox,	"	51	48	1,567 68	94.11
E. T. Fox,	"	17	8	384 80	47.05

OWNER.	Town.	Number Tested.	Number Condemned.	Amount.	Per Cent. of Disease.
A. J. Thissell, . . .	Dracut, . . .	10	7	\$296 52	70.00
O. Merrill, . . .	" . . .	14	2	75 00	14.28
Thompson Island Farm } School. }	Boston, . . .	{ 33 26	28 15	1,280 00 685 00	84.84 57.69
D. M. Davis, . . .	Newburyport, . . .	9	2	55 00	22.22
G. A. Minot, . . .	" . . .	2	2	62 00	100.00
G. Dokum, . . .	" . . .	10	1	38 00	10.00
J. M. Chase, . . .	" . . .	11	3	95 00	27.27
W. H. Safford, . . .	" . . .	5	2	90 50	40.00
A. T. Newhall, . . .	" . . .	21	10	298 50	47.61
F. D. Moseley, . . .	" . . .	32	7	181 00	21.87
C. P. Bartlett, . . .	" . . .	20	14	529 50	70.00
J. Mahoney, . . .	" . . .	5	1	45 00	20.00
E. G. Moseley, . . .	" . . .	2	1	30 00	50.00
G. F. Penniman, . . .	Chelmsford, . . .	20	13	627 00	65.00
J. Plummer, . . .	" . . .	22	7	269 00	31.81
H. D. Pierce's estate, . . .	Canton, . . .	57	3	135 00	5.43
Town Farm, . . .	Billerica, . . .	18	13	558 00	66.66
J. N. Pardee, . . .	" . . .	5	2	70 00	40.00
W. Holden, . . .	" . . .	23	4	203 00	17.39
N. R. Jones, . . .	" . . .	23	15	667 00	65.22
A. Woodward, . . .	" . . .	3	3	165 00	100.00
G. E. Simons, . . .	" . . .	5	5	270 00	100.00
J. Sullivan, . . .	" . . .	6	6	191 88	100.00
B. Kerney, . . .	" . . .	5	4	215 00	80.00
D. Lane, . . .	" . . .	12	11	504 67	91.66
J. E. Rowell, . . .	" . . .	18	11	559 50	61.11
H. Dutton, . . .	" . . .	1	1	45 00	100.00
F. A. Patch, . . .	Boxborough, . . .	36	9	332 00	25.00
Geo. Mixter, . . .	Hardwick, . . .	68	1	15 00	1.48

Private Test reported by Dr. J. F. Winchester.

J. Plummer, . . .	Chelmsford, . . .	11	9	\$408 00	81.81
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Private Tests reported by Dr. M. Bunker.

T. L. Lane, . . .	Wayland, . . .	25	17	\$577 50	68.00
J. T. Cowen, . . .	" . . .	10	7	222 50	70.00
F. S. Kimball, . . .	Brighton, . . .	-	-	-	-

Private Test reported by Dr. G. N. Kinnell.

Baker Bros., . . .	Lanesborough, . . .	42	37	\$1,217 00	88.08
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Private Tests reported by Dr. C. S. Moore.

F. Kimball, . . .	Danvers, . . .	17	4	\$170 00	23.53
B. W. Perry, . . .	" . . .	-	1	-	-
J. E. Porter, . . .	" . . .	8	7	262 00	87.49
J. B. McCarthy, . . .	" . . .	12	5	265 00	41.66
O. F. Putnam, . . .	" . . .	-	1	35 00	-
J. M. Putnam, . . .	" . . .	8	3	70 00	27.49
J. Swinerton, . . .	" . . .	2	1	20 00	50.00

Private Test reported by Dr. J. H. Seale.

OWNER.	Town.	Number Tested.	Number Condemned.	Amount.	Per Cent. of Disease.
M. Thurlow, . . .	Amesbury, .	8	8	\$262 00	100.00

Private Test reported by Dr. A. H. Streeter.

W. A. Harlow, . . .	Cummington, .	18	9	\$340 00	50.00
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Private Test reported by Dr. A. L. Cundall.

J. D. Tyler, . . .	Berlin, . . .	14	2	\$52 50	14.28
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Private Test reported by Dr. A. S. Cleaves.

E. W. Goddard, . . .	Barre, . . .	3	1	\$30 00	33.33
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Private Tests reported by Dr. C. A. Hamblet.

R. D. Coburn, . . .	Dracut, . . .	-	1	\$50 00	-
E. T. Fox, . . .	" . . .	-	10	511 00	-
N. D. Peavey, . . .	" . . .	4	3	125 00	75.00
F. R. Hill, . . .	" . . .	-	2	87 50	-
G. Brown, . . .	" . . .	-	1	47 50	-

Private Test reported by Dr. W. S. Eaton.

E. Mills,	Dracut, . . .	5	4	\$150 00	80.00
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Private Tests reported by Dr. E. Knobel.

G. W. Wetherbee, . . .	Dedham, . . .	2	2	\$55 00	100.00
G. Reed,	" . . .	2	2	50 00	100.00

Private Test reported by Dr. J. H. Dutton.

J. P. Emerson, . . .	Chelmsford, .	40	11	\$405 00	27.05
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Private Test reported by J. W. Robinson.

C. Whitmore, . . .	Natick, . . .	28	18	\$766 00	64.28
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Private Test reported by Dr. S. O. Fowle.

OWNER.	Town.	Number Tested.	Number Condemned.	Amount.	Per Cent. of Disease.
A. R. Jones, . . .	Wellesley, .	-	1	\$35 00	-

Private Tests reported by Dr. G. N. Kinnell (2d test).

J. Kiriher, . . .	Dalton, . . .	16	-	-	-
J. A. Bourgnier, . . .	" . . .	18	-	-	-
G. Loehr, . . .	" . . .	13	-	-	-
W. Kiriher, . . .	" . . .	15	-	-	-
H. Finger, . . .	Lanesborough, .	14	-	-	-
Thomas Brennan, . . .	" . . .	19	-	-	-
J. E. Lamb, . . .	" . . .	8	-	-	-
Dow Bros., . . .	" . . .	8	-	-	-
E. A. Wood, . . .	" . . .	24	-	-	-
D. B. Dewy, . . .	Lenox, . . .	25	-	-	-
F. E. Curtis, . . .	" . . .	23	-	-	-
F. S. Clark, . . .	Richmond, . . .	18	-	-	-
F. Loehr, . . .	Washington, .	23	3	\$125 00	13.04
J. Newbury, Jr., . . .	" . . .	30	-	-	-
J. Eichelser, . . .	" . . .	22	-	-	-
P. Eichelser, . . .	" . . .	21	-	-	-

These figures are interesting, because they show relatively the amount of disease in a large number of herds. It will be noticed that the herds in the western part of the State show only a very small proportion of disease. These herds had previously been tested and cleaned up, this being the second test.

It would appear also that there are fewer cows in the western part of the State that react, and consequently the barns there are not so saturated with infectious material. These tests, however, have their value as tending to show on a large scale what proportion of the cattle in the State would react to the test. The proportional number of reacting animals would appear to be exaggerated, were it not for the fact that these figures are corroborated by other herds tested at various intervals by different parties, where the per cent. of disease appears to be about the same. The only conclusion that we can arrive at, then, is that the number of animals that react to the test is extremely large. Fortunately, by far the larger proportion of these cases have only slight localized tuberculosis, the majority of which might never develop.

While this testing was going on, and previous to the passage of the law relating to private testing of herds, the Board began to realize the necessity for the passage of some such law. It was evident that many of these owners had not realized what they were undertaking; it was evident that others had no intention of co-operating with the State in endeavoring to get rid of the disease, and certainly there was little use in attempting to help those who would not try to help themselves. Being written to and talked to seemed to have little effect; it was only when told that they were laying themselves liable to forfeit their right to compensation in the future that there was any perceptible improvement. (See letter to owners of herds tested by private test, page 25.)

In this connection, the report on the amount of cleansing and disinfection that has been done by these owners is instructive: —

	Filthy Stables.	Unclean Stables.	Clean but not Disinfected.	Satisfactory Stables.
First visit, . .	11	42	35	52
Second visit, . .	4	7	32	33
Third visit, . .	2	4	4	3

It will be noticed that, after being written to, in only 52 out of 140 barns first visited had the owners cleansed or disinfected their premises after the removal of diseased animals. On the second visit the showing was a little better, — 85 out of the 140 visited had been cleaned and were in a satisfactory condition; but it was not only in the case of those having had their herds tested by private test that disinfection was ordered. All barns from which cattle were taken, as tuberculous, were ordered disinfected, and inspectors were instructed to call the attention of owners to section 45, chapter 491, etc. : —

Inspectors will please call the attention of owners to section 45, chapter 491 of the Acts of 1894, as amended by section 10, chapter 496 of the Acts of 1895. This section makes provision for the

compensation of owners, provided "such person shall not have, prior thereto, in the judgment of the Cattle Commissioners, by wilful act or neglect contributed to the spread of tuberculosis." If after suitable notice an owner introduces diseased animals into his herd, or fails to thoroughly disinfect his premises, he contributes to the spread of tuberculosis by neglecting to take reasonable precaution against the spread of the disease, and lays himself liable to forfeit his right to compensation.

The regulations issued by the Board bearing on this subject are as follows: —

REGULATIONS OF MASSACHUSETTS BOARD OF CATTLE COMMISSIONERS FOR CLEANSING AND DISINFECTING BARNs.

[These must be complied with by owners of cattle which the State pays for.]

In attempting to get rid of tuberculosis in a herd of cattle, it should be remembered that not only is it necessary that all the diseased animals be picked out and either isolated or destroyed, but that no new animals should be introduced unless they have been tested and are known to be free from disease.

The barns should also undergo a thorough renovation, and be properly cleansed and disinfected before they are again occupied.

In renovating or remodelling barns, the great importance of sunlight, thorough ventilation and good drainage should always be borne in mind.

Disinfection of the barns is always necessary to destroy any infectious material that may have been left after the removal of diseased cattle. The best disinfectant we know is sunlight. Germs of disease will live but a short time when exposed to the direct rays of the sun; and for this reason, if for no other, a southerly exposure and plenty of windows in the barn are to be desired.

In proceeding to disinfect a barn, the first and perhaps the most important step to be taken is to collect all rubbish, have the walls, ceilings and floors thoroughly swept and cleansed of all litter, dust, cobwebs and the like. The floors, mangers, feeding troughs and stanchions should be carefully scraped and cleaned, special care being taken with the corners, and all of the rubbish collected and burned.

All odds and ends of boards and old broken mangers and partitions should also be removed and burned, and, when occasion requires it, new plank floors should be laid in place of old ones.

After cleansing thoroughly with hoe and broom, and hose if running water is convenient, and, if the barn contains a boiler, with scalding water or live steam, applied with a hose, or, failing

that, with boiling water and soft soap or washing soda, a solution of bichloride of mercury (corrosive sublimate), 1 to 1,000 parts of water, should be applied with a whitewash brush and poured over the floors (corrosive sublimate should be used in wooden vessels, as it corrodes metal ones).

After applying the corrosive sublimate, the ceilings, walls, partitions, mangers, etc., should again be washed and gone over with warm, freshly made whitewash; a half pound of chloride of lime to the gallon of whitewash is an addition that may make it more effective. Fumigating with sulphur or chloride gas is not of any great value in ordinary stables.

In using corrosive sublimate, it must be borne in mind that it is a dangerous poison, and mangers and partitions should be carefully washed after applying this mixture, and then again scalded or whitewashed.

If at a season of the year when the animals can be turned out, the stables should be left vacant for some time, with doors and windows open.

Six months after the first test the herd should again be tested and undergo a careful physical examination, so as to be certain that no diseased animals have been overlooked, and the barns should again be thoroughly disinfected.

Great care should also be taken that all animals have been tested before their introduction to the herd.

It would appear, from the report of the inspector, that this work needed to be looked after. It will be noticed that, out of over 700 barns visited, only 59 had been cleansed and disinfected satisfactorily at the first visit; on the second visit the figures were reversed, and instead of 397 filthy barns there were only 43. The work is summed up as follows:—

	Filthy Stables.	Unclean Stables.	Clean but not Disinfected.	Satisfactory Stables.
First visit, . .	397	141	120	59
Second visit, . .	43	37	211	234
Third visit, . .	3	11	106	26

The general law under which the inspectors are appointed further provides, under section 20, chapter 491 of the Acts of 1894, as amended by section 6 of chapter 496 of the Acts of 1895, that “inspectors must be present at all

licensed slaughter houses or establishments upon the day or days designated for slaughter, and there carefully examine at the time of slaughter the carcasses of any and all neat cattle, sheep and swine slaughtered thereat. And it shall be the duty of such inspectors also to examine at the time of slaughter any and all neat cattle, sheep and swine when owned by any person not engaged in such business, and when the same are slaughtered upon his own premises other than a slaughter house, etc., unless the said animal is less than six months old, or has been inspected within six months prior to such slaughter, and a certificate of health has been delivered to the owner or person in charge."

Under section 5, chapter 491 of the Acts of 1894, every inspector shall keep a record of all inspections and his doings thereon, and shall make regular returns of all such inspections to the Board of Cattle Commissioners. Under this provision the inspectors have reported the following work:—

Number of cattle inspected at time of slaughter, under section 21,	975
Number of sheep inspected at time of slaughter, under section 21,	157
Number of swine inspected at time of slaughter, under section 21,	3,345
Number of cattle inspected at licensed slaughter houses at time of slaughter,	187,416
Number of sheep inspected at licensed slaughter houses at time of slaughter,	405,201
Number of swine inspected at licensed slaughter houses at time of slaughter,	1,468,334
<hr/>	
Total number of animals inspected at time of slaughter, including those inspected at licensed slaughter houses, and also under section 21,	2,065,428
<hr/>	
Cattle destroyed as tuberculous,	302
Sheep destroyed as tuberculous,	*2
Swine destroyed as tuberculous,	105
Percentage of cattle found infected, . . . . .	.16
Percentage of sheep found infected,	—
Percentage of swine found infected, . . . . .	.0071
Number of towns with licensed slaughter houses,	102
Number of licensed slaughter houses,	228

* These were probably not tuberculous, but were cases of *Oesophagostoma Columbianum*, which was very likely mistaken for tuberculosis by the local inspector.

The second division of the work — the examination of all cattle coming into the markets at Brighton, Watertown and Somerville from without the State for sale, — is an exceedingly important one. Its object of course is to provide a market where those desiring to secure tested cows can do so. This is important, and would be valuable if it were possible to rely on these tests as correct; unfortunately, there is frequently good reason for doubting the reliability of many of them.

During the year from Dec. 15, 1896, to Dec. 15, 1897, the number of cattle received at Brighton has been as follows: —

Maine cattle,	12,040
New Hampshire cattle,	1,890
New York cattle,	689
Massachusetts cattle,	9,964
Western cattle,	14,719
Sheep,	55,260
Swine,	639,374
Veals,	28,878
Horses,	4,060
Cattle released by certificate,	10,540
Cattle tested,	171
Cattle released after test,	141
Cattle released for slaughter,	9
Cattle condemned,	21

Watertown, Dec. 15, 1896, to Dec. 15, 1897.

Vermont cattle,	6,609
New Hampshire cattle,	8,144
New York cattle,	274
Massachusetts cattle,	933
Western cattle,	171,562
Sheep,	514,608
Swine,	766,920
Veals,	63,927
Horses,	24,762
Cattle released by certificate,	8,240
Cattle released by pasture tags,	99
Cattle tested,	42
Cattle released after test,	34
Cattle released for slaughter,	1
Cattle condemned,	7

Somerville, Dec. 15, 1896, to Dec. 15, 1897.

Western cattle,	114,562
New England cattle (Vermont and New Hampshire),	4,421
Massachusetts cattle,	1,082
Sheep,	367,202
Calves,	46,262
Hogs,	13,172
Cattle released on certificates,	688
Cattle tested and released,	14
Cattle condemned, actinomycosis,	2

Recapitulation.

Total number cattle for beef,	346,889
Total number sheep,	937,070
Total number hogs,	1,419,466
Total number calves,	139,067
Total number horses,	28,822
Total number released on certificates,	19,468
Total number tested at stations,	227
Total number released at stations,	199
Total number condemned at stations,	28
Total number condemned for actinomycosis,	2

In all from Dec. 15, 1896, to Dec. 15, 1897, 346,889 cattle have passed through Brighton, Watertown and Somerville from outside the State. During the same period of time, from Dec. 15, 1896, to Dec. 15, 1897, 7,068 cattle have been admitted to the State on special permit.

This division of the work, the examination and identification of cattle coming in from without the State upon special permit, also deals with the admission of out-of-State cattle; and it has been found that the difficulties and disadvantages to be met with at the Brighton, Watertown and Somerville markets are to be met with in this department of the work as well. It is expected, of course, that these cattle are tested either before or after arrival.

The table following shows the number of cattle brought in month by month on special permit, making in all 7,068 cattle brought in on 492 permits:—

From Dec. 15, 1895, to Dec. 31, 1896,	421
January, 1897,	333
February, 1897,	261
March, 1897,	462
April, 1897,	289
May, 1897,	198
June, 1897,	315
July, 1897,	325
August, 1897,	703
September, 1897,	857
October, 1897,	1,374
November, 1897,	1,187
December, 1897,	343
Total,	7,068

The question of the advisability of placing quarantine restrictions on cattle coming into a country or State is one that is thoroughly well established. In Europe quarantine regulations and the requirement of the tuberculin test is very general. On this continent both the United States and Canadian governments require it, and it is also required by several of the different States before cattle are permitted to pass their borders. Unfortunately, the difficulties in its enforcement are great. The alternative consists in the Board appointing their own agents to do the testing in the various States from which the cattle are generally shipped. Consequently, at a meeting of the Board, held October 2, it was decided that the Board should appoint their own agents to do the testing on cattle coming in from without the State; and in pursuance with this decision the following letters were prepared, and will be issued as soon as the list of out-of-State agents is completed:—

Letter to Agents.

Boston, Jan. 1, 1898.

DEAR SIR:—The Massachusetts Board of Cattle Commissioners is of the opinion that, in order to protect the cattle owners of Massachusetts from bovine tuberculosis to the greatest practicable extent, the work of testing cattle outside the State, to be brought into Massachusetts, should be done in the most careful and efficient manner possible.

In order to perfect this branch of our work as far as we are able, it has been decided to consider those testing cattle with tuberculin, for farmers and dealers, to be brought into this State,

as our agents outside of this Commonwealth, and this Board will only accept the tests of such men as we approve of.

All tests are to be made at the expense of the owners or buyers, and not at that of the Massachusetts Cattle Commission.

Each tested animal must have an ear-tag, furnished by this Board at cost; the number on the ear-tag must correspond with the number on the certificate; and the appearance of the animal must also agree with the description of the certificate, otherwise the certificate will be considered valueless.

You have been approved of by the Massachusetts Board of Cattle Commissioners to test neat cattle to be shipped to Massachusetts, and we will continue to accept your tests as long as we are of the opinion that they are being made in a careful and conscientious manner; if at any time, however, we have reason to be dissatisfied with your work, we retain the privilege of summarily dropping your name from our list.

We also request you to keep us informed as to the source of the tuberculin you use, the strength of the solution and size of dose, all of which must meet with our approval.

Per order,

MASSACHUSETTS BOARD CATTLE COMMISSIONERS.

Letter to Dealers.

Boston, Jan. 1, 1898.

DEAR SIR:—The Massachusetts Board of Cattle Commissioners is of the opinion that, in order to protect the cattle owners of Massachusetts from bovine tuberculosis to the greatest practicable extent, the work of testing cattle outside of this State, to be brought in here, should be done in the most careful and efficient manner possible.

In order to perfect this branch of our work as far as we are able, it has been decided to consider those testing cattle with tuberculin, for dealers and farmers, to be brought into Massachusetts, as our agents outside of this Commonwealth, and this Board will only accept the tests of such men as we approve of.

A printed list of the men we consider reliable will be furnished on application. This list may be revised from time to time, as new applicants may be added or men who prove either dishonest or incompetent are dropped from it.

All tests are to be made at the expense of the owners or buyers of the animals, and not at that of the Massachusetts Cattle Commission.

All neat cattle over six months old brought into the State purporting to have been tested will be quarantined and tested, unless

such test has been made by an authorized out-of-the-State agent of the Massachusetts Board of Cattle Commissioners.

Each tested animal must have an ear-tag, furnished by this Board at cost; the number of the ear-tag must correspond with the number on the certificate; and the description on the certificate must also agree with the appearance of the animal, otherwise the certificate will be considered valueless.

Per order,

MASSACHUSETTS BOARD CATTLE COMMISSIONERS.

The fourth division of the work, the conduct of laboratory and stable experiments to determine problems connected with the work of the Board, has been fruitful of results. Under this head may be classed the retesting of certain herds that had previously been tested by the Board. This work illustrates well the difficulty that sometimes exists in freeing a herd from tuberculosis. The work has been tabulated, and shows that in some cases the herds have been tested several times, yet, although possibly to a less extent, the disease still exists in many of these herds.

	1894.			1895.			1896.			1897.		
	Number Tested.	Number Condemned.	Per Cent.	Number Tested.	Number Condemned.	Per Cent.	Number Tested.	Number Condemned.	Per Cent.	Number Tested.	Number Condemned.	Per Cent.
Henry Heywood, Gardner,	{ - - -	- - -	-	81 30 37.03	- - -	-	50 27 54.00	100 31 31.00	-	106 12 11.32	- - -	-
P. M. Harwood, Barre, .	- - -	- - -	-	27 20 74.07	- - -	9 1 11.11	- - -	- - -	-	- - -	- - -	-
T. P. and C. S. Root, Barre,	- - -	- - -	-	36 3 8.33	- - -	29 5 17.24	- - -	- - -	-	- - -	- - -	-
G. L. Clemence, South- bridge.	- - -	- - -	-	26 5 19.23	- - -	34 5 14.70	- - -	- - -	-	- - -	- - -	-
F. B. Bridgeman, West- hampton.	- - -	- - -	-	11 5 45.45	- - -	22 5 17.85	- - -	- - -	-	- - -	- - -	-
Baker Brothers, Lanesbor- ough.	- - -	- - -	-	- - -	- - -	42 37 88.09	- - -	- - -	-	- - -	- - -	-
Geo. H. Ellis, West New- ton.	{ 69 29 42.02	- - -	-	- - -	- - -	79 13 16.04	134 23 17.16	-	-	148 6 4.05	- - -	-
Geo. H. Ellis, Concord, .	{ - - -	- - -	-	- - -	- - -	64 6 9.37	38 1 2.62	-	-	62 4 6.45	- - -	-
Geo. H. Ellis, Kendal Green.	{ - - -	- - -	-	- - -	- - -	74 20 27.02	49 5 10.20	-	-	50 - -	- - -	-
F. B. Page, Gardner, .	- - -	- - -	-	28 3 10.70	- - -	- - -	30 3 10.00	- - -	-	- - -	- - -	-
J. Eichelser, Washington, .	- - -	- - -	-	18 2 11.11	- - -	- - -	22 - -	- - -	-	- - -	- - -	-
Farm School, Thompson Island.	{ - - -	- - -	-	28 3 10.71	- - -	- - -	26 15 57.69	- - -	-	30 - -	- - -	-

NOTE. — The difference in these figures between the number of animals tested on the first and later tests is accounted for by the purchase of new animals that *had been tested* or by the natural increase in the herd.

In the case of Mr. Ellis's herd an endeavor was made to locate the source of reinfection, and the diseased portions of six of the last cows were submitted to Prof. Theobald Smith, to get an opinion as to the age of the lesions. His opinion on this point was a singularly strong confirmation of the opinion that the cattle contracted the disease after their introduction to the barn. These cows were tested and appeared all right before being bought. They reacted after three months had elapsed; on autopsy the lesions were found to be slight, and on examination by Professor Smith he stated that in his opinion they were only from two to three months old. This would seem to indicate that the disease was probably contracted in the barn, and corroborates the opinion held by the Board of the danger to cattle recently introduced into infected barns. This danger exists to a greater or less extent in all barns that have been inhabited by diseased cattle.

Another idea that naturally suggests itself is that it might be well to advise every farmer or owner in the State to cleanse and whitewash his barn say twice a year, whether any cattle have been taken out or not; in this way, if any infectious material existed in the barn it would at least be reduced in quantity, the danger would be lessened, and of course if this disinfection was kept up it would materially lessen the amount of infectious material, and therefore lessen the danger to the other cattle in the barn. On the other hand, if neither diseased cattle nor infectious material had been in the barn, it would at least do no harm to wash and whitewash, and it would tend to inculcate ideas of cleanliness where perhaps they had been wanting.

During the year, on the request of several owners, and on their promising to observe certain conditions, a number of animals that had reacted to the test were kept in quarantine in separate buildings for observation and experimental purposes.

In the month of December, 1894, a bull belonging to G. H. Ellis of Newton was tested, with the following reaction:—

Dec. 28, 1894—7.30 A.M., 101; 5 A.M., 99.4; 7 A.M., 101.1; 9 A.M., 101;
12 M., 101.1; 3 P.M., 103.1; 5 P.M., 102.3.

It has since been tested six times, showing the following reactions : —

March 18, 1896 — 8 P.M., 101; 6 A.M., 101, 101.2, 103.4, 104.4, 104.3, 104.2, 104.3, 104.2, 103.

June 13, 1896 — 9.30 P.M., 101.1; 7.30 A.M., 102.3, 103.1, 103.1, 103, 103, 103, 101.3.

June 20, 1896 — 9.30 P.M., 101; 6.30 A.M., 101.2, 101.3, 101.2, 101.2, 101.3.

Aug. 18, 1896 — 7 P.M., 101.2; 5 A.M., 101.1, 101, 102.2, 103.4, 104, 103.4, 103.4.

Aug. 18, 1897 — 8 P.M., 101, 101.1; 7 A.M., 101.2, 103.1, 104.3, 105.

December, 1897 — 6 P.M., 101; 4 A.M., 100.3, 100.3, 100.2; 100.1, 100.

It will be noticed that the bull was tested June 13, and again on June 20. At the second test there was no reaction; this is a characteristic of tuberculin, as frequently there is no reaction at a second test until a considerable time has elapsed.

On the last test, in December, 1897, there was again no reaction; but whether this was due to an insusceptibility to the test or to the cure of the disease, it is impossible to say at the present time.

In the month of February, 1897, the Board received notice from Dr. Kinnell of Pittsfield that he had tested a herd of Siementhal cattle, consisting of four cows and a bull, two of which had reacted to the test. These tests were accompanied by a letter from Dr. Kinnell, which is as follows : —

WILLIAM DOUGLAS SLOANE, Esq., *Lenox.*

Four Cows and a Bull tested Feb. 11 and 12, 1897. — Breed, "Siementhal" Cattle.

Numbers on Horns.	10 P.M.	8 A.M.	10 A.M.	12 M.	2 P.M.	REMARKS.
635	101	101.2	100.2	100.6	101.4	- -
414	100.8	103	105	108	107	- -
76	101	102.6	102.2	101.4	101.4	Heavy in calf.
71	101	102.4	102.8	102.4	102	Aborted four weeks ago.
Bull.	101.6	106	107	106.6	105.4	- -

No. 414 had a chill, commencing twelve hours after injection and continuing four hours. She was noticed to cough during the chill. Bull had a chill, commencing at eighth hour after injection and lasting six hours.

Dr. PARKER, *Secretary Massachusetts Cattle Commission.*

DEAR SIR : — These animals were imported from Belgium about six months ago. They were kept in quarantine for three months, Garfield, N. J., and brought here on a permit from your office last September (1896). They were at once put in quarantine by Inspector Flint of Lenox, and have been so kept ever since.

In regard to Nos. 635, 76 and 71, I would say that I consider them free from tuberculosis. Nos. 76 and 71 gave slight reactions, but, from the fact that they showed no constitutional symptoms, and from the fact that No. 414 and the bull gave such decided reactions, I should think that the slight reaction was due to the peculiar conditions under which they have been kept, and perhaps also due to their breeding. In addition to these, one of them aborted comparatively recently, and the other is heavy in calf.

The owner of these animals purchased and brought them to this country at very great expense, and, apart from that, is most anxious to establish a herd of this breed. Consequently, I am commissioned to write to you and try if we cannot arrange to deal with them somewhat differently than with ordinary cases. Knowing that with proper care it is quite possible to breed sound stock by this bull and from the diseased cow, we would like it if you would allow this cow and bull to remain permanently in quarantine or until further orders, and not to slaughter them. Mr. Sloane is willing to give every assurance and guarantee that they will not be sold, or moved from the farm, or killed for beef, or brought into contact with other animals, except of course in the case of the bull being allowed to copulate with the cows.

I would say that Mr. Sloane fully appreciates the dangers of tuberculosis, and is fully in sympathy with all that is being done to eradicate it. Two years ago he cleaned up his herd of blooded Jerseys at great pecuniary loss, and would not now do anything that would in the least endanger the health of his herd; and any special features of quarantine which you might suggest or wish in regard to these animals would be rigidly carried out. But, if this is more than you as a State official can grant, would not the fact that they have been brought such a long journey and have been kept under such varied and trying conditions justify you in keeping them indefinitely in quarantine for retest?

Hoping that this may meet with the favorable consideration of your Board, I remain,

Truly yours,

GEO. N. KINNELL.

P.S. Of course Mr. Sloane would agree to waive all claims for quarantine expenses, and would sterilize or destroy the products from the diseased cow, as you might direct.

G. N. K.

On receipt of this letter from Dr. Kinnell, the owner was communicated with and the following answer received : —

642 FIFTH AVENUE, N. Y., Feb. 18, 1897.

JOHN M. PARKER, Esq., *Secretary*.

DEAR SIR : — Your favor of the 16th has been forwarded to me from Lenox.

The few "Siementhal" cattle I possess form part of a herd imported last August, and were at the United States government quarantine station until end of November. The large portion of the herd are now in New York, and were inspected by the State veterinarian and given a clean bill. I cannot but think that in my case the reaction from test shown in two of my herd must be due to some climatic conditions, for tuberculosis is not known in the locality from which these cattle come. My main object in importing them was to cross them with my Jerseys. As latter breed seemed sensitive to the disease, I shall be glad to have Dr. Kinnell confer with my manager again ; latter will carry out whatever instructions he may receive. Yours truly, WM. D. SLOANE.

After a meeting of the Board, the owner and Dr. Kinnell were both communicated with. The letter to the owner was as follows : —

COMMONWEALTH OF MASSACHUSETTS.

BOARD OF CATTLE COMMISSIONERS, BOSTON, March 1, 1897.

Mr. W. D. SLOANE, 642 Fifth Avenue, New York.

DEAR SIR : — As I promised you, I brought the matter referred to in my last letter to you before the meeting of the Board, held on February 22, and I am instructed to write you that the Board is willing that you should be allowed to keep the cattle and breed from them, providing that we have your guaranty that they will be kept separate from the rest of the herd, that the State will not be called upon to pay for quarantine expense, that no milk will be sold from the cow, and that the Board are kept informed of the results of any further tests.

Of course you can easily see why we ask this of you, because, if this cow is allowed to mix with the rest of the herd, it would not be fair for the State to pay for any animals that might contract the disease from her ; at the same time, we do not wish to put any person to the expense of bringing valuable cattle into the State and stop his breeding from them, if he so desires ; in fact, we will be willing to do everything in our power to further the breeding and improvement of cattle in this direction.

Yours truly, JOHN M. PARKER, *Secretary*.

The two reacting animals were kept entirely separate from the herd, and had separate yards to run in. On this matter Dr. Kinnell writes as follows : —

PITTSFIELD, MASS., Feb. 19, 1897.

DEAR DR. PARKER : — We were very glad to have your notice of a provisional permission to retain the bull and cow at Mr. Sloane's in quarantine. The bull is kept in a box stall apart from the other houses, a stall specially built for him; the cow will be kept in another stall being constructed for her, and each will have yards to themselves apart from all the other stock. In a few days I will be down there again to see arrangements completed.

On January 2 and 3, 1898, the bull was again tested, with the following result : —

10 P.M., 102.1; 8 A.M., 106; 10 A.M., 106.1; 11.30 A.M., 106.2; 1 P.M., 106.

Dr. Kinnell notes that : —

This bull has been going back for the last four months; does not keep up in condition, and coughs a great deal. I could not by auscultation detect anything but violent percussion made him cough. He has been used on the cows until within a few weeks, and has proved satisfactory in getting the cows with calf. From eight o'clock until eleven this morning he was suffering from a chill, trembling, eyes running and his cough aggravated.

G. N. K.

The test on the cow was as follows : —

Normal temperature, 9 P.M., 101.1; 8 A.M., 103; 10 A.M., 103.2; 11.30, 104.3; 1 P.M., 106.2

The note on this cow is as follows : —

This cow is in good condition, does not cough; but, although she has been served by different bulls, she has not been got with calf.

G. N. K.

This morning from ten o'clock until noon she was suffering from rigors.

Another and most important part of the experimental work has been the work done during the past year by Prof. Theobald Smith at the Bussey Institute. When the office of the Board was moved from Village Street to the Commonwealth building, the laboratory was abandoned and

special arrangements were made with Dr. Langdon Frothingham, at the Harvard Medical School, to do such microscopical work as was found to be necessary. (For Dr. Frothingham's report, see page 119.)

The Board was also anxious to have some original research work done. They felt that it would be well to take up some of the questions in relation to tuberculosis that were still unsettled, and endeavor to throw some further light on them. In this matter the Board had the good fortune to secure the co-operation of Prof. Theobald Smith, and they desire to thank him at this time for his generosity in placing his services at their disposal. The cost of buying and keeping the cattle has been defrayed by the Board, the remainder of the work having been done by him free of charge.

For some time there has been a feeling in certain quarters that it was a serious question whether human and bovine tuberculosis were really identical. There was a dearth of information on this matter, and it was felt that further work should be done in this direction. Consequently Dr. Smith's promise of co-operation was received with a great deal of satisfaction. (For the full report of Dr. Smith's work, see page 126.)

The final results and conclusions drawn by Dr. Smith from his work make it by far the most important work of the year. The report is summed up as follows:—

Leaving these aside, the remaining parts of the test appear to me to be of sufficient uniformity and accuracy to justify us in drawing certain preliminary inferences. We may now maintain that bovine tubercle bacilli and human bacilli as found in sputum are not identical. The difference in their action upon cattle is reinforced by certain differences in the bacilli themselves and their effect upon rabbits, as will be detailed in a fuller report.

What the significance of these divergencies is, what influence they have upon the transmissibility of the disease from cattle to man, we are unable at present to state with any degree of certainty. That they do have some effect must be admitted, in view of results of studies upon other species of pathogenic bacteria. Their precise bearing needs careful investigation.

These studies will, I think, warrant one inference, however; that is, that human sputum cannot be regarded as specially

dangerous to cattle, nor can it be looked upon as a factor in the introduction of tuberculosis into a healthy herd of cattle. Even if the tubercle bacilli of cattle and of man are very closely related and have the same ancestry, as we all must admit, if we regard the two as mere varieties, which may eventually under very favorable conditions pass one into the other, the condition in which the bacillus leaves the lungs in sputum is evidently such as to interfere, *under ordinary circumstances*, with any development in the bovine body. It would fall a speedy prey to destruction.

It is interesting to notice that this work of Dr. Smith's confirms the conclusions arrived at by Dr. Frothingham a year ago. In last year's report, page 57, Dr. Frothingham says:—

From these facts we are certainly justified in concluding that calves are apparently not particularly susceptible to the human tubercle bacillus; but whether this non-susceptibility is due to a bacillus of diminished virulence for the bovine, or to the age of the animals experimented upon, or to some other cause, further experiment must demonstrate.

While it may be conceded that bovines are not susceptible to human tubercle bacilli from sputum, yet it by no means follows that human beings are therefore not susceptible to that of the bovine. At the same time, the great danger of the use of the milk and flesh of cattle suffering from tuberculosis has undoubtedly been greatly exaggerated, for the reason that human tuberculosis has been steadily decreasing during the last thirty-five or forty years, while the bovine tuberculosis has undoubtedly increased during the same period.

It cannot be denied that cows with tuberculous udders or that are extensively diseased, even though no lesion can be detected in the udder, give tubercle bacilli in the milk; and, until it is clearly demonstrated that these bacilli are harmless to the human race, such animals must be looked upon as dangerous to the public health.

From the flesh of tuberculous animals there is much less danger than from the milk, as in this community meat is, as a rule, sufficiently well cooked to destroy the vitality of these germs; while, on the other hand, it is customary to use milk in an uncooked condition. In fact, the danger

from meat is really more from bacilli that may be smeared upon its surface from butcher knives that may have come in contact with tuberculous lesions or infected lymphatic glands than from the flesh itself, as it is doubtful if the muscles ever contain the germs of tuberculosis; but, even if the bovine tubercle bacilli were harmless to the human race, it is not a pleasant thought to contemplate using the milk and meat of animals affected with a disgusting and loathsome disease as food for the people of an intelligent, educated and civilized community.

Considered from a public health point of view, the local inspection work would seem to be sufficient for its protection at the present time, if done in an intelligent and painstaking manner. This is an important work, and on general principles, if for no other reason, it would not seem to be advisable to keep these advanced cases, or cases of tuberculosis of the udder, in the dairy. In fact cows with nodulated udders should be considered as unfit animals for milk production, as such udders, when not tuberculous, may be infected with actinomycosis or pus-producing bacteria, either of which should be looked upon as dangerous.

In this direction the local inspectors seem to have been doing good work, judging from the smaller proportion of cases of advanced generalized tuberculosis that have been found during the year, as compared with previous years.

In removing the animals that are quarantined by the local inspectors year after year, picked out as diseased on physical examination, there is no advance to speak of in diminishing the prevalence of tuberculosis among cattle, as a crop of slightly diseased ones are left behind, which in time may develop the disease, so that the succeeding year an equal number will be condemned; and this may be carried on year after year, to infinity, unless something more than this is done.

This may be accomplished in various ways: first, our cattle owners must be educated to pay more attention to the sanitary surroundings of their stock; they should be taught, if possible, to keep only healthy animals under the most healthful surroundings. Those who take pride in their cattle should strive to keep a herd that will not react to the

tuberculin test, and to buy only animals that have been tested with tuberculin.

The funds appropriated by the State for the eradication and control of contagious animal diseases should first be used for the regular work of the Board, including the expenses attendant upon the taking of such cattle as are found to be diseased which the local inspectors have quarantined. If, after this is done, the Cattle Commissioners have sufficient funds at their disposal, what is known as "voluntary request work" should be done; that is, the Cattle Commissioners may test an entire herd at the owner's request, provided he agrees to buy only tested cattle after those that react are removed, and will also agree to thoroughly disinfect his stable as directed by the Board, and take all such other measures to keep his herd free of the disease as may be recommended.

In doing such work, care must be taken to choose only such farms as have buildings that can be thoroughly disinfected, or where the owner has a new barn into which he wishes to move a herd which suffered from this disease in the old barn. There are many New England farm barns that it is almost impossible to disinfect; here, voluntary request testing is of no value. The owner must either pay more attention to hygiene and cull out the bad cases from time to time, or, if he wishes to entirely eradicate tuberculosis from his herd, he must decide to build a new stable.

A single test is not always sufficient to remove all the diseased animals; hence, a second should follow the first within two or three months. The applicant must understand that it may be necessary to repeat the test, and to repeatedly disinfect in order to have the work successful, and that this requires intelligence, patience, perseverance and some expenditure of money.

There are two sides to the question of dealing with bovine tuberculosis, — one is its bearing upon the public health, the other is that it is an insidious, slow-developing, infectious disease of the bovine, yearly inflicting considerable pecuniary loss upon the dairyman and stock breeder. It has been allowed to continue its ravages unnoticed and unchecked for many years, until we have awakened to the fact that our herds are

widely infected with it; and steps should be taken to reduce it to a minimum in a reasonable and economical manner, in order that the public at large may receive milk as far as possible from healthy animals, and the farmers be protected from pecuniary loss.

The disposal of the carcasses of diseased animals is an important matter. Sections 10, 11 and 15, chapter 491 of the Acts of 1894, provide that the carcasses of diseased animals shall not be used for food. Section 37 gives a list of diseases to be deemed contagious under this act, tuberculosis being among the number.

The Board of Cattle Commissioners has always construed this law to imply that the carcass of an animal infected with tuberculosis, no matter how slight or how localized the lesion may be, is not to be used for beef, but must be either rendered or buried.

This appears to be an extravagant and wasteful ruling, as there does not seem to be any well-grounded objection to the use of the meat from very slightly diseased animals. For instance, a beef may have a tuberculous mediastinal, or bronchial lymphatic gland, no larger than the end of a man's thumb, or even no larger than a pea, and be perfectly healthy in other respects; and yet, under a strict construction of the Massachusetts law, that animal must be rendered or buried. Dr. Theobald Smith makes a division of tuberculous animals into two classes, "*infected*" and "*diseased*." The "*infected*" are those having some slight local glandular lesion, yet enjoying perfect health in other respects. The "*diseased*" are those having more or less well-marked lesions in various organs and glands of the body. The saving would perhaps be more upon animals killed in slaughter houses in condition for beef than among cows killed by order of the Cattle Commissioners, for as a rule milch cows are not in beef condition; at the same time, it must be borne in mind that the local inspectors are apt to have slight lesions escape their notice when a cow is killed for beef, but if a cow is tested with tuberculin, she is hunted from the tip of her nose to the tip of her tail, until the nodule or nodules that caused the reaction are found.

In Germany, France and Great Britain it is the usual

practice to pass as sound all meat from animals in which the lesions are slight or localized ; where the disease is general or the carcass emaciated, the meat is destroyed. In this country the United States inspectors of the Bureau of Animal Industry, stationed at the large abattoirs where animals are killed for export or interstate commerce, do the same thing ; where the disease is localized, the meat is considered sound ; and when the lesions are extensive or generalized, the meat is condemned.

This is an important economic problem, and the propriety of so modifying our State laws regarding the disposal of the products of animals infected with tuberculosis as to have them conform to the rules and regulations of the United States Bureau of Animal Industry for the inspection of meat, should be carefully considered.

Another recommendation for carrying on the work at a less cost has to do with the advisability of reducing the rate of compensation for animals condemned as tuberculous by the Board. In the report of the special joint committee appointed by the last Legislature to investigate the killing of certain cows from Dracut and Lowell, last spring, condemned by the tuberculin test of private veterinarians, the majority of the committee reported as follows : —

From our observations at the investigation, we hold that the Board of Cattle Commissioners should at once take into consideration modifications of the law relative to the condemnation of cattle by tuberculin test alone, — that is, upon the request of owners of cattle for such testing of their herds. If cattle are to be condemned, or regarded as suspicious animals only after they show signs of disease, it is a question as to the propriety or equity of the State paying full value for those that are actually diseased. This proposition we respectfully refer to the consideration of the next General Court, trusting that the Board of Cattle Commissioners will, in the mean time, consider the same question and offer recommendations in their annual report.

In endeavoring to comply with this request, the advisability of any longer paying full compensation must be seriously questioned. The present law provides that full appraised value not exceeding sixty dollars be paid for cattle

killed as tuberculous; "that, whenever any cattle condemned as afflicted with the disease of tuberculosis are killed under the provisions of this section, the full value thereof, at the time of condemnation, not exceeding the sum of sixty dollars for any one animal, shall be paid to the owner thereof out of the treasury of the Commonwealth, if such animal has been owned within the State six months continuously prior to its being killed; provided such person shall not have, prior thereto, in the judgment of the Cattle Commissioners, by wilful act or neglect, contributed to the spread of tuberculosis; but such decision on the part of the commissioners shall not deprive the owner of the right of arbitration as hereinafter provided." (Section 45, chapter 491, Acts of 1894, as amended by section 10, chapter 496, Acts of 1895.)

This is a very delicate question, and one requiring to be handled with the greatest care. In many instances it is found that from some localities certain names appear upon our books more frequently than any other persons, seeming as though special individuals found it profitable to buy suspicious cows and sell them to the State at an advance on the purchase price.

Then, again, certain farmers last spring employed veterinarians to test cattle, with the idea, in many instances, of selling unprofitable cows to the State, and using the money to buy new ones that had not been over grained and milked out, leading to passage of act to prevent owners receiving compensation for cows, etc.

No person having animals tested with tuberculin shall be entitled to compensation from the treasury of the Commonwealth for any animals that react to the tuberculin test, unless such testing be done by the State Board of Cattle Commissioners, or their authorized agents acting as such at the time of the test; and such testing shall be subject to the supervision and control of the State Board of Cattle Commissioners.

Furthermore, local inspectors quarantine cows on suspicion that show no physical evidence of disease, which react to tuberculin, are killed and found to have some slight lesion. The owner puts a new cow in place of the old one, that may not be free from tuberculosis, or, if she is, may in six months

be diseased to the same extent (or more) as the old one, if he has neglected to disinfect the place where the old one stood, or has been careless about it. This would not be the case in any of the above instances, if compensation were not paid in full.

The wisdom of paying full compensation for cattle that react to tuberculin is doubtful, except perhaps in cases where an owner is compelled to have his whole herd tested. If partial compensation only were paid, fewer cattle would be killed by the commission, and at a less proportionate cost to the State, giving more opportunity to test herds for owners who wish to eradicate tuberculosis, which our funds do not allow us to do now. Moreover, there would be no applications, under reduced compensation, for voluntary request tests, except from those who were sincere in their desire to eradicate tuberculosis from their herds, as part of the loss would fall on the cattle owner, and he would not be willing to incur his share of the loss unless he was honest in his wish to rid himself of this disease, which Professor Walley enumerates as one of the "four bovine scourges."

Scientists in various countries have been working for a number of years, and still are, to discover an immunizing or curative agent for tuberculosis; and it is possible that in time, perhaps in a few months and perhaps after the lapse of several years, a material may be produced with which cattle may be rendered immune from tuberculosis, or that even tuberculous cattle may be cured. When these discoveries are made, it will certainly be the duty of the State to avail itself of them. Under the present law, the Cattle Commission has power to create quarantine stations and to experiment with animals in the study of contagious diseases; hence it would seem that the Board has discretionary power to change its methods with the advance of modern scientific research. Meantime, we have tuberculin as a fairly reliable diagnostic agent; it should be used to verify the diagnosis on cattle condemned as tuberculous on a physical examination; and where owners of herds are desirous of eradicating this scourge from among their cattle, we know it can be done where the test is applied two or three times, and the owner complies with the laws of hygiene and has a barn that can

be properly disinfected. We also know, from Bang's experiments, that when a breeder exercises intelligent care it is possible to raise a healthy herd from a diseased one, and in the mean time much can be done in an educational way to improve the existing conditions.

Ordinarily, for the transmission and development of tuberculosis among dairy cattle long and intimate association is required. This close and intimate association of the diseased with the healthy is a condition that commonly exists on the average New England farm, the frequency and seriousness of the infection depending on the amount of infectious material present and on the susceptibility of the different individuals in the barn.

When an animal inhales the dust containing the tubercle bacilli, the bacilli are absorbed through the mucous membrane lining the air passages, and usually find lodgement in the bronchial or mediastinal glands. The presence of the bacilli in these glands, or the constant reinfection from the introduction of new bacilli, stimulates the cells immediately surrounding the bacilli, and the result is that a nodule, or tubercle, is formed. The disease may not go any further until from some cause the resisting power of the animal is weakened; the disease may then develop, and the animal finally falls a victim to tuberculosis. That this is ordinarily the course of the disease is borne out by the fact that in by far the larger number of cases the thoracic glands are found to be the initial seat of the disease, and frequently on post-mortem examination the animal is found to be only very slightly infected. Under such conditions it follows that every precaution should be taken to prevent the development of these slight localized cases, and anything that tends to undermine and weaken the health of the animals should be avoided.

In attempting to prevent the spread of the disease, one of the most important matters to be attended to is to endeavor to reduce the amount of infectious material present in the barn, for of course the greater the amount there is present the greater the likelihood that the cows in that barn will become infected; and, in endeavoring to reduce the quantity of this infectious material, it should be recollected that disinfection

and washing are not the only methods that should be adopted.

When a ray of light penetrates a dark room, innumerable particles of dust may be seen floating in the air; these particles of so-called dust are organic matters given off by the occupants of the barn, as well as fungi, bacteria and particles of hay, grasses, etc., which make good carriers for the various forms of bacteria; and it is this dust that is so dangerous as a source of infection in tuberculosis.

This can be better realized, perhaps, when it is pointed out that the manure is, and must be considered, one of the dangerous factors by which the disease is spread in the stables: it very frequently contains the tubercle bacilli, and when it dries it becomes pulverized and powdery, and along with the discharges from the nose it mixes with the dust and chaff, and when stirred up it is carried in the air and is breathed by the cattle, which are frequently kept tied in the barn all winter long without any form of exercise. Under such circumstances the circulation naturally becomes sluggish, less oxygen is required by the body, the breathing becomes shallow and the lungs are not expanded; and when any extra strain is put upon them they are unable to do their work, and we have rupture and permanent dilation of the air cells, along with weak lungs and a predisposition to pulmonary disease. In other words, we have just the condition most suited to the development of tuberculosis, and at the same time the animal is breathing an atmosphere impregnated with infectious material.

Bearing this in mind, then, one can readily see how important it is to thoroughly ventilate the barns. When the hot, foul, infected air is continually being diluted by fresh outside air, of course the continual dilution lessens the proportional amount of infectious material in the air, and therefore lessens the danger from its inhalation; and not only is there less danger from infection, but the health of the animals is better. When only a small quantity of Co_2 is contained in the air, the Co_2 in the lungs is very readily diffused through the atmosphere; but when that atmosphere has become impure, when it contains a large quantity of Co_2 with organic impurities, then the Co_2 in the lungs is not so

readily diffused through the air ; it sooner finds its level and is retained in the system, where, from want of oxygen, the vitality is lowered and the dulness and lethargy experienced such as is felt by any one after sleeping all night in a close room.

Most farmers that object to the admission of fresh air in their barns do so because they say that cold barns and cold draughts blowing on the cattle will check the flow of milk ; but it is not necessary to have these cold draughts. Judgment must be used to see that the admission of the fresh outside air does not cause draughts ; the volume of the incoming air should be broken up and evenly distributed through the barn, so that currents of cold air and draughts are avoided. The question of the absolute necessity of good ventilation and pure air, and its influence on health, is not merely a theoretical one, but, as will be shown later, its immense influence on health and disease can easily be demonstrated.

The want of drainage and the presence of dark and damp cellars under the barns is another matter that bears a close relationship to the warmth and comfort of the barn. The cellar is usually dark and damp ; the sun never shines there, and either the drip from the floor above or the surface drainage from the yard keep it in a continual state of moisture. This continual dampness below the barn is in a great measure responsible for the cool, chill feeling that one often feels on entering a barn. The cellar is never drained ; it dries only by evaporation, and the feeling of chill that one experiences is a direct result of the warmth being used up in the work of evaporation. One hardly realizes what this amounts to ; but we are told by Professor Kedzie (New Hampshire Board of Health report, 1893, Vol. II.) that : —

To evaporate one pound of water consumes enough heat to raise the temperature of five and one-half pounds of water from freezing to boiling point ; or, to vary the illustration, suppose that a tile drain discharges constantly for one day a stream of water whose cross-section is one square inch and velocity two and one-half miles an hour, — this *one day's drainage* alone would save the heat equivalent to nearly six tons of coal.

Further, we must remember that barns are usually warm ; this warmth causes a current of air upwards, so that this damp, chilly air is drawn up into the barn above, where it does the most harm. In referring further to damp surroundings, Professor Kedzie again forcibly remarks :—

The *evaporation* of so much water renders the air over such a soil damp and chilly. The result is a physical necessity. This damp and chilly atmosphere has a more serious result than the simple feeling of discomfort. It has a most depressing influence on the human system, lowering its tone, enfeebling the vital powers, and acting as the predisposing cause of a long list of diseases, some of them the most destructive and incurable known to the medical profession. The depressing influence of the dampness and chilliness of a water-soaked soil is not to be compared to the effect of an occasional wetting, as when we are caught in a shower. The chilly dampness of the undrained soil is persistent and unremitting, dragging us down with its cold fingers at all hours, at “noon of day and noon of night,” as if we toiled and rested, waked and slept in a perpetual drizzle of cold rain. It may seem a small force at first, but its persistent, untiring and relentless pull tells upon the strongest at last, like the invisible fingers of gravity which finally drag down all to a common level. This depressing influence is not developed suddenly and distinctly, but silently and secretly the sapping and mining go on, till the explosion comes in sickness, suffering and the sleep that is eternal.

If it is necessary to have cellars, then it is necessary that the floor of the stable should be water-tight ; that the cellar should be well lighted and ventilated ; that both cellar and subsoil should be well drained ; that the manure, instead of being dumped into the cellar, should be taken some distance from the barn, and the liquid taken up by absorbents or carried to a cesspool, where it can be made use of, instead of going to waste by soaking into the subsoil below the barn.

Light is another essential in the thorough disinfection of barns that is too often neglected. The majority of barns have only one or two small windows, rarely larger than say eighteen or twenty-four inches square, usually thick with dust, and giving a “dim, religious light,” or none at all. Only very few barns have windows sufficiently large to give free admittance to the sunlight. Owners of cattle do not

seem to realize that sunlight is just as essential to the health of animal life as it is to plant life. There is no reason why barns should not be as light as dwelling-houses; and the responsibility for its exclusion from barns must rest with the old theorists, who claimed that cattle would fatten and do better when kept in the dark than when exposed to the light. It has seemingly taken a long time for this idea to be abandoned, and even at the present time it seems to be impossible to teach some people that light is not detrimental to the health of dairy stock. It is especially necessary where, through want of fresh air and exercise, the circulation is sluggish and the system depressed.

Light stimulates the circulation, and with increased oxidation more Co_2 is given off and the functions of the whole body are quickened and enlivened; but sunlight also retards the growth of germ life, and the vitality of certain forms of bacteria, including *tubercle bacilli*, is destroyed in a few hours' time by the direct action of the sunlight. Sunlight is not only the best, but the cheapest, disinfectant we know.

In referring to the question of sanitation and tuberculosis, Dr. James Russell, in the report of the Glasgow Board of Health, says that:—

The death rate from “phthisis” has fallen from 2,849 per million to 2,316, and from other tubercular diseases from 1,090 per million to 884, in both cases 19 per cent.,—a result which quite casts into the shade the improvement in Prussia and Saxony, quoted from Cornet, which he puts to the credit of special prophylaxis. Clearly, then, we are warranted in asserting that among infectious diseases tuberculosis is the most amenable of all to general hygienic measures; that, in fact, from these alone as good results are obtained as from hygienic measures plus isolation, disinfection, etc., in the case of diseases popularly known as infectious. It is not implied that special measures directed against the infectivity might not have produced even better results; but in view of what has been accomplished, and in view of the difficulties in the way of special prophylaxis, it is contended that more is to be expected from general hygiene.

The New York Medical Record (Dec. 30, 1893), in referring to sanitary conditions in Great Britain, says:—

The average annual death rate throughout England and Wales during the twenty years previous to 1870 did not vary greatly from 22.5 per 1,000 of population; and it was estimated by Mr. Simon that 125,000 persons died each year of diseases due to defective sanitary conditions. Although Simon's figures were thought by some to be exaggerated, they nevertheless had great weight in persuading Parliament to adopt the reforms recommended by him. During the next twenty years extensive improvements were carried out on a large scale, with the result that in 1889 the mortality had fallen to 17.9 per 1,000, thus more than justifying the calculations of Simon.

In referring to this same subject, Prof. F. Smith of Aldershot, in his "Manual of Veterinary Hygiene," says:—

The mortality amongst the horses of the French cavalry was at one time frightful; previous to 1836 they lost 180 to 197 per 1,000 per annum; the air space being increased reduced the losses in the next ten years to 68 per 1,000.

The following table* shows the number of cases of lung and glanders diseases among the horses of the French cavalry from 1847-66, a period of nineteen years:—

	1847-52	1853-56	1857-61	1862-66
	Ratio per 1,000.	Ratio per 1,000.	Ratio per 1,000.	Ratio per 1,000.
Glanders,	23.32	21.44	10.97	7.24
Inflammation of lungs and pleura,	104.7	110.6	45.8	3.59

This table shows that in nineteen years a reduction of 16.08 per 1,000 had occurred in cases of glanders, and no less than 101.11 in cases of pneumonia and pleurisy. These wonderful results were obtained through the labors of a Commission of Veterinary Military Hygiene, which pointed out the necessity of the ventilation of stables, increased cubic capacity and attention to sanitation, feeding and general care. The practical outcome of these results was that a saving of £90,000 per annum was effected in the purchase of horses alone.

* Copied from a most interesting and valuable paper on "The Vital Statistics of Cavalry Horses," by Dr. Balfour, F.R.S., "Journal of the Statistical Society," June, 1880.

The only explanation of the great difference in the mortality is the larger amount of pure air supplied, and the better ventilation of the stables.

And again, in the report of the State Board of Health of New Hampshire for 1892, in speaking of this matter, it says : —

There is no doubt of the great mortality from consumption in persons living in badly ventilated rooms. A few years ago the proportion of deaths among the soldiers of European armies from this cause was very high; but now, owing to better ventilation, the other conditions remaining the same, the percentage has greatly fallen. In one regiment in England, when the barracks were not ventilated, the death-rate for lung diseases was $12\frac{1}{2}$ per 1,000; but after efficient ventilation had been introduced it fell to $1\frac{1}{2}$ per 1,000.

Parkes gives a similar example from two hospitals in Vienna. In one, very badly ventilated, of 4,280 prisoners, 220, or 51.4 per 1,000, died of consumption; of these, 42 of galloping consumption. In the well-ventilated hospital, of 3,037 prisoners, 24 only, or 7.9 per 1,000, died of the same disease. The conditions in the two hospitals, excepting ventilation, being alike, the badly ventilated one had six and a half times as many deaths from this cause alone as the better-aired one.

The statistics collected by Dr. Buchanan on this subject are also instructive : —

In Salisbury, England, after the introduction of improved drainage, the annual death rate from phthisis fell from $44\frac{1}{2}$ per 10,000 to $22\frac{1}{3}$ per 10,000 between 1857 and 1864. In the same period of time, in the towns of Ely, Rugby, Worthing, Macclesfield, Leicester, Newport and Banbury, the death rate from phthisis fell 47, 43, 36, 51, 52, 52 and 50 per cent., respectively, in consequence of improved drainage alone.

The importance of this matter is also shown in the report on the experimental work by Ernst and Peters, at Mattapan, where, in referring to the effect of improved sanitary conditions on diseased cows, it says : —

Before the farm buildings were used at all, they were thoroughly cleaned from top to bottom. Every portion of old manure was carted away, as well as all the old earth. The whole of the wood-

work was scrubbed and then washed with corrosive sublimate solution (1.1000) and finally whitewashed, and every care taken to secure good drainage and ventilation. The result and effectiveness of all this have been best demonstrated by the fact that every animal brought to the place made a most marked improvement in its general condition, while some of them even went so far as to appear to get well. (Ernst.)

The same thing is shown in the case of some cattle at Mr. French's farm at North Andover, where several animals were slaughtered after testing with tuberculin; a number of the remaining animals that reacted to the tuberculin test were turned out to pasture, and in the fall they were brought in and retested by the State authorities, and they failed to react, the recovery evidently having resulted from the open-air life in pasture during the summer months.

A similar incident is related by Professor Law. He says:—

In 1877 I recognized the existence of tuberculosis in the Jersey herd of Burden Bros. of Troy. The worst were slaughtered, but some incipient cases in young animals were turned out in a pasture by themselves, where they passed the summer in apparently robust health, but they began to droop when returned to the barns in the fall. (Paper by Prof. James Law, read at Peterborough, N. H., December, 1892.)

These are only a few of the examples showing the great influence that the surroundings have on the health of the animal body; pages of statistics could be quoted and figures given showing the same results, but that would only be an unnecessary repetition, as the immense importance of good sanitary and hygienic conditions is generally accepted by every one.

In suggesting improvement on the present method of constructing dairy barns, cheapness of construction and convenience in handling, as well as the health of the stock, have been borne in mind. Of course these ideas can be elaborated or modified according to the wealth of the owner and the amount of money to be expended on the buildings; but, whether the cost is to be great or small, it is absolutely necessary, if the health of the cattle is to be maintained, that there should be pure air and good ventilation, as well as

sunlight, drainage and dryness in and around the farm buildings.

In building new barns, many progressive farmers have adopted the idea of using the old barn for storage purposes, and stabling the cattle in a one-story building or shed adjoining. This arrangement admits of many advantages; it is more easily ventilated and lighted, it has no cellar, the hay and food is not contaminated with the odor from the cattle, and it is an economical form of construction and can be erected at comparatively little cost.

Among the more expensive examples of this form of construction may be mentioned the cattle barn at the Lyman School for Boys, at Westborough. The cow stable at the Millwood Farm, Framingham, is another good example of this form of barn. It is unusually well lighted and ventilated, and simple in design and construction.

In making calculations as to the amount of cubic space required for each animal, we should remember that each cow uses approximately 1,000 cubic feet of air per hour. Now of course, if the barn admits of each cow having 1,000 cubic feet of air space, then the air in the barn will need to be renewed each hour; and of course, if the air space provided is less, then correspondingly the supply of fresh air will need to be more frequent; but where the cubic space is greater, the supply may be less frequent. The problem, then, is to carry away the foul, impure air, and to supply each animal with 1,000 cubic feet of fresh air each hour in such a manner as not to cause a draught on the animals. To do this, the air must not be admitted in bulk, nor must it move at a greater speed than 3 feet per second, — in fact, the slower and more imperceptibly it moves into the barn, the less draught will there be.

Many farmers attempt to admit fresh air by keeping door or windows open; the result is that a body of cold air finds its way in and falls directly on the back of the cattle; the cattle stand and shiver, and curl up, look miserable, and fall off in their milk; and the farmer is discouraged, and makes up his mind that fresh, cool air does no good to the cattle, but rather does harm, and he won't admit any more than he can help. To prevent such a condition of affairs, and to

keep draughts from the cattle, fresh air should either be admitted high up, or should be directed upwards so as to become tempered before it falls. By directing up toward the ceiling, by admitting it in small openings, and by breaking up draughts and currents of air by louvre boards, air will be diffused through the building, and large quantities of air can be admitted without causing any appreciable draughts or other ill effects.

A good method of introducing fresh air is by wooden pipes or boxes placed below the floor opening outside, and having the external opening screened to keep out the dust. These should communicate with upright boxes opening well up in the barn, the opening directed upward and broken up with louvre boards, or screens, or netting at the top to break up the current of air and distribute it.

Ventilators, or openings for the foul air to escape, should always be at the highest part of the roof. The openings should be protected so that the wind will not blow down and check the upward current of foul air, but the wind should be utilized so as to cause a partial vacuum on the lee of the building, or ventilator; the vacuum thus caused will have a tendency to suck the foul air up and out of the barn. Thorough ventilation is of course much easier to accomplish when the building is heated by artificial means; but by taking advantage of the wind and the natural warmth of the barn, much can be accomplished even without artificial heat.

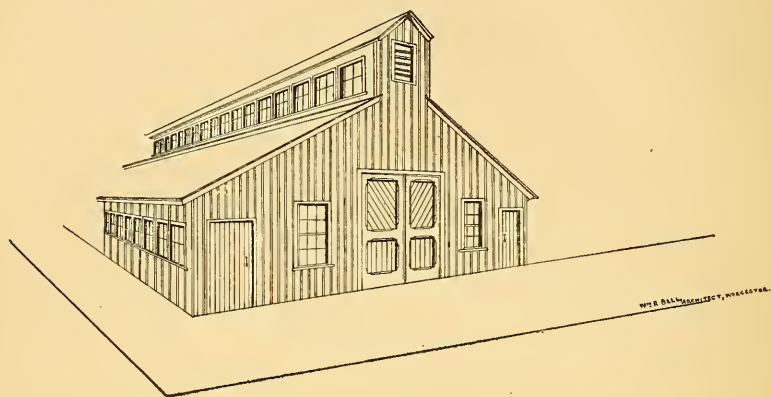
One of the best points in the Millwood Farm buildings is the good window space. In building barns, owners should remember that they cannot have too much light, and windows do not add enough to the cost of the building to counterbalance their great benefit.

A practical point in the arrangement of this barn is placing the calf pens next the window, and in this way protecting them from being broken by the horns of the passing cows.

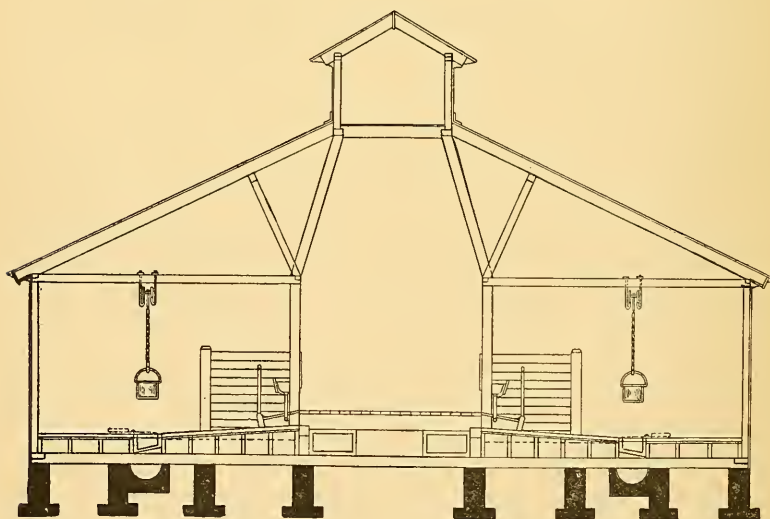
The floors, and especially the manure gutter of barns, should always be tight; otherwise the liquid manure will saturate the floor below the barn, besides wasting a valuable fertilizer. As a matter of economy, if for no other reason, arrangements should always be made either for the absorption of the liquid portion or for carrying it to a tank or

cesspool, where it can be stored until drawn off and spread on the land.

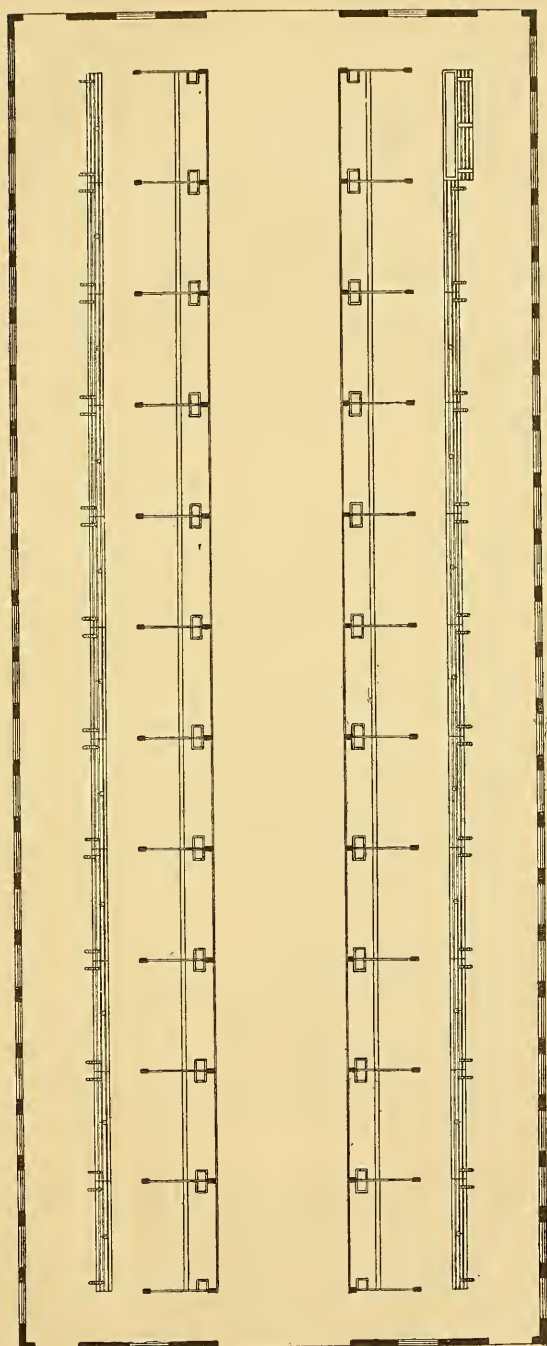
In presenting the following sketch of a cow stable, it has been the purpose of the Board to submit ideas of a stable



which is adapted to most of our Massachusetts farms ; and, while it has been our intention to leave out nothing that enters into the comfort and healthfulness of the animals, we



have aimed at a building of small cost, in which it is possible to handle the herd with economy. On most of our farms the stable can be built onto the end or side of the present



barn, thereby utilizing the old barn for storage of fodder, and also using the cellar under the old barn, if there be one, as a dump for the manure. The plan provides for a drive through the centre of the stable, for purpose of feeding; for raised cribs adjoining the floor or feed walk, whereby a herdsman can not only have his eyes on the feeding of every animal, but he will feed and clean the cribs of forty cows in such a stable easier than five where fed in box cribs, and do it more perfectly and easily, and his work can be inspected at a glance; for a self-watering device, giving the advantage of having a constant supply of water before the cattle at all times; for a slanting manure gutter, in which the cows will seldom stand; for a stable which is very light and well ventilated.

TEXAS FEVER.

During August a number of cases of Texas fever occurred, thirty-five head of cattle dying that were reported to the Board of Cattle Commissioners, with the possibility of a few other animals having died that were not reported to the Board. These cases were confined entirely to three carloads from New York State, as follows:—

On August 2, E. N. Smith of Watertown brought a carload of nineteen cows from Herkimer County, New York, of which number thirteen died within fifteen days of Texas fever. These animals were sold to different parties, and went out into the country into herds owned by the following persons:—

C. A. Dennen, Pepperell,	2
Jonathan Davis, Sterling,	1
Mr. Lumnie (sold to McGowan), Dedham,	3
Mr. Horton, Fall River,	3
W. J. Navell, Lexington,	1
A. S. Gushee, Dorchester,	1
Cash (name of purchaser not known),	1
George Durth,	1
— 13	

On August 9, Geo. N. Smith of Watertown brought a load from Jefferson County, New York, consisting of seventeen cows and one bull. Of these, the following animals died, bought by persons whose names are here given:—

C. A. Dennen, Pepperell,	1
E. B. Wilbur, West Bridgewater,	3
Walter Dennis,	1
Wm. Bowen, Providence, R. I.,	2
	— 7

All of these died within fifteen days from the day they were landed at Brighton.

On August 16, Geo. N. Smith brought another car-load of twenty-two cows from the same place. Of these, fifteen died; two others were very sick, but have partially recovered. These were bought by :—

H. E. Eames, Framingham,	7*
J. Berry, Cambridgeport,	1
Warren Davis, Needham,	1
John Swinerton, Danvers,	2
J. S. Henry, Watertown,	5
	— 15
Total,	35

The loss of these animals and the source of their infection seemed to the members of the Board to be so serious a matter that it was decided to employ a special agent, having expert knowledge of this disease, to investigate this outbreak, and make a full report concerning it.

The services of Dr. Cooper Curtice of Moravia, N. Y., were secured, he being a former employee of the Bureau of Animal Industry, United States Department of Agriculture, and having had an extensive experience with Texas fever and a broad knowledge of its cause and mode of extension. Dr. Curtice commenced his labors for the Board of Cattle Commissioners September 18, and brought them to a close on October 9, making his report with the following letter of transmittal October 11 :—

MORAVIA, N. Y., Oct. 11, 1897.

DR. AUSTIN PETERS, *Chairman, Massachusetts Cattle Commissioners,*
Boston, Mass.

SIR :—I send by this mail my report on the outbreak of Texas fever in your State. I have included some remarks upon the pre-

* 6 died.

vention of future outbreaks. While they seem to reflect strongly upon the management of the United States Bureau of Animal Industry, I trust that the presentation of the facts will not only enlarge the present duties of these United States officers, but call the attention of your State and others to the need of more careful work being done by them. Public officials often fail to do what they themselves deem right, because of failure of funds and a public opinion that will sustain them in their action.

I am, very respectfully, yours,

COOPER CURTICE,
Veterinarian.

The history of the source, transportation, distribution and subsequent deaths of the cattle concerned in the outbreak in eastern Massachusetts, obtained mainly through the efforts of Commissioner Dennen, is as follows : —

First Carload. — Mr. E. N. Smith of Watertown, Mass., bought nineteen cows in Herkimer County, New York, from five different men, as follows : —

Will Cotter, Little Falls, N. Y.,	.	.	.	.	.	9
A. L. Eaton, Little Falls, N. Y.,	.	.	.	.	.	6
V. Farrell, Newport,	.	.	.	.	.	1
James Moone, Coldbrook,	.	.	.	.	.	2
James Doyle, Newport,	.	.	.	.	.	1
						<hr/> 19

These were shipped from Herkimer, N. Y., consigned to Brighton, Mass., in a Rome & Watertown car No. 10028. They arrived at West Albany stock yards on Sunday, August 1, where they were unloaded to be fed and watered, and driven into pen 16, alley D, for a few hours. They were then reshipped to Brighton stock yards, where they arrived Monday night, August 2. They were driven into pens 11 and 13, Texas alley, and thence into pens 34 and 35, thence they were released and distributed to the surrounding country. Thirteen head out of the nineteen thus handled died soon after. One cow died on August 11, one on August 12, three about August 14, one on August 17, and one on August 20.

Second Carload. — Mr. Geo. N. Smith of Watertown, Mass., bought seventeen cows and one bull in Jefferson County, New York, from thirteen farmers, as follows : —

Rush Pennal, Pamela, N. Y.,	1
Mr. Zimmerman, Pamela, N. Y.,	1
C. Klock, Pamela, N. Y.,	1
Wm. Reese, Evans Mills,	2
D. A. Rich, Watertown,	1
Wm. Weale, Watertown,	1
Charles Hawley, Ellisburg,	2
George Butts, Ellisburg,	2
Mr. Scott, Ellisburg,	1
John Eastman, Ellisburg,	1
A. O. Davis, Ellisburg,	1
Mr. Griffin, Rutland,	1 bull, 2
Charles Ferguson, Rutland,	1

1 bull, 17 cows.

These were shipped from Watertown, N. Y., consigned to Brighton, Mass., in Rome & Watertown car No. 10033. They arrived in West Albany stock yards on Sunday, August 8, where they were unloaded and driven to pen 16, alley D. After a few hours they were reshipped to Brighton stock yards, where they arrived Monday night, August 9, and were driven into pens 11 and 13, Texas alley; thence into pens 34 and 35, to be distributed to the surrounding country. Of these eighteen head, seven died: two on August 18, one on August 22 and two others about the same time.

Third Carload.—Mr. Geo. Smith bought another carload of cattle, consisting of twenty-two cows, from twelve different farmers in Jefferson County, as follows:—

Mr. Colon, Cape Vincent, N. Y.,	1
"Abe," Cape Vincent, N. Y.,	2
Mr. Vincent, Cape Vincent, N. Y.,	3
Mr. Walker, Cape Vincent, N. Y.,	2
Louis Ives, Freed settlement,	1
W. R. Smith, Antwerp,	4
David Taylor, Antwerp,	1
Mr. Mason, Antwerp,	1
Wm. Umpstead, Freed settlement,	4
D. A. Rich, Watertown,	1
John Leahr, Dexter,	1
L. Hill, Dexter,	1

These cattle were shipped from Watertown, N. Y., consigned to Brighton, Mass., in a New York Central car No. 23897 or 23015. They arrived at West Albany stock yards Sunday, August 15, where they were driven into pen 17 D. After being rested, fed and watered, they were reshipped, and arrived in Brighton Monday evening. They too were driven into pens 11 and 13, Texas alley; thence into pens 34 and 35, whence they were distributed. Of these, fifteen died: three before August 27, six before August 31, and two recovered.

The above three carloads of cows were all that have been reported as having been affected with Texas fever, that were distributed in eastern Massachusetts.

The diagnosis of Texas fever in the dead cattle has been made on the following data:—

1. Specimens of spleens and kidneys of two cows, owned by Commissioner Dennen of Pepperell, were examined by Dr. Frothingham, pathologist to the commission, and the micro-parasite (*Pyrosoma bigeminum* Smith), the cause of the disease, was found. This diagnosis was confirmed by Dr. Theobald Smith, pathologist of the Massachusetts State Board of Health, the original discoverer of the cause of the disease. Mr. Dennen lost three cows.

2. Specimens from a cow owned by Mr. Eames of Framingham, Mass., and submitted by W. P. Mayo, also yielded the micro-parasite upon examination by Dr. Frothingham. Mr. Eames lost six cows; one other was sick, but recovered.

3. Specimens of spleen from cow owned by James McGowan of Dedham, Mass., and submitted by Dr. G. B. Foss of Harvard Veterinary Hospital, also yielded the micro-parasite to Dr. Frothingham. Mr. McGowan lost three cows of the same disease.

4. Commissioner Dennen secured a full-grown cattle tick (*Boöphilus bovis* (Riley sp.) Curtice), about the middle of September, from one of Mr. Eames' cows that recovered from the disease.

The positive determination by the finding of the micro-parasite in four animals involved in this outbreak, and the finding of the tick on the recovered animal, fully demonstrates the outbreak to have been due to Texas fever.

A fourth carload of cattle, taken from northern New York to western Connecticut, suffered with the disease, and the facts of the outbreak have been gathered in fulfilling your directions on this point. These facts were given by Mr. W. B. Sprague, commissioner on domestic animals, Hartford, Conn., Mr. D. H. Canfield, Bridgewater, Conn., of the firm of Odell & Canfield, the cattle dealers who imported the cattle, and others.

Fourth Carload.—Mr. M. W. Odell of Roxbury Centre, Conn., bought eighteen cows, nine heifers and four calves in St. Lawrence County, N. Y. They were shipped from Norwood, N. Y., consigned to New Milford, Conn., *via* Utica, in New York Central car No. 22931. They arrived at the West Albany stock yards Sunday, August 1, and were driven into pen 15, alley D, to be fed, watered and rested. They remained here until Monday, August 2, when they were reshipped to New Milford, where they arrived Tuesday, August 3. They were then driven to Mr. Canfield's farm, two miles south-east of New Milford. On the 4th of August they were driven to Roxbury, and kept on Mr. M. W. Odell's farm, separate from other cattle. The distribution of these is as follows :—

August 5, H. N. Allen, Pawling, N. Y.,	. . .	2 cows, 2 died.
August 5, Wm. O'Brien, Roxbury, Conn.,	. . .	1 cow, 1 died.
August 5, Alonzo Whitehead, Roxbury, Conn.,	. . .	1 cow.
August 5, Chas. Botchford, Roxbury, Conn.,	. . .	2 cows, 1 died.
August 9, G. W. Hurlburt, Roxbury, Conn.,	. . .	2 heifers.*
August 16, Anthony Mazotos, Naugatuck,	. . .	1 cow.
September 9, C. H. Sanford, Bridgewater,	. . .	1 cow.
September 15, Chas. Botchford, Roxbury,	. . .	1 cow.
October 1, now in lot, Roxbury,	. . .	5 cows.
October 1, now in lot, Roxbury,	. . .	5 heifers.
Buried in lot,	. . .	3 heifers, 3 died.
Buried in lot,	. . .	3 heifers, 3 died.

It is thus apparent that, of the twenty-seven head, ten died. One heifer was temporarily sick, but recovered. Mr. Odell found five ticks upon her, each half as large as the little finger nail. A careful search yielded none on October 1, the time of my inspection.

The following notes will indicate the character of the disease, and the post-mortem appearances as near as can be arrived at :—

Mr. O'Brien's cow was taken sick Friday, August 13, and died Sunday night, August 15. She was examined Monday morning. The flesh looked well; the spleen enlarged, soft, pulpy and dark; the gall bladder large, with thickened contents; the kidneys dark, even black; the lungs and heart perfectly healthy; the intestines all right; the bladder full. Mr. O'Brien reported that the cow passed dark-red water while sick.

Mr. Odell's cow calved August 14, and seemed well, but did not come to her milk. She first appeared sick Monday, August 16, and died Tuesday night, August 17. She passed red water on

* Two years old.

August 15. She was examined by Mr. Canfield, Mr. Odell and Dr. R. S. Todd, of New Milford. The symptoms were almost identical with those of the O'Brien cow.

On Tuesday afternoon, August 17, one cow was found dead in the pasture, and two missing. The missing cows were found Wednesday; one was dead, the other sick.

On Thursday, August 19, a three-year-old heifer was examined in the presence of Commissioner Sprague, Mr. Canfield and others. She had the same appearances as the O'Brien and other cows. One cow was observed to be sick August 19, while the commissioner was there. She died Saturday, August 21.

Messrs. D. H. Canfield and H. M. Canfield, South Britain, saw ticks on the Odell cow. They were about the size of wheat grains. Dr. R. S. Todd, veterinarian, of New Milford, Conn., saw the post-mortem of Mr. Odell's cow: "The intestines were empty; the manifolds baked; the lungs and heart normal; the liver and spleen enlarged; bladder filled with black urine; gall bladder filled with cheesy gall."

He also saw two others, which he says were in almost the same condition, but the spleens not nearly as large. They were, however, larger than normal, and dark. One had yellowish cast to liver. The temperature of cows that he took ranged from 105° to 106.4° F. One, an Ayrshire, was sub-normal, 96° F. This cow died that night, after Dr. Todd left.

Mr. Walter Booth, a butcher, opened at least three cows. All had red water in bladder; one had a very soft liver; one had very black gall; the spleen in one was about twice the usual size, others larger than usual.

Though the determination of the cause of death in these cattle is not as scientifically accurate as in the case of the Massachusetts cattle, there is little room for doubt that these cattle also died of Texas fever. The history of transportation through pen 15, alley D, at West Albany, where, as will be maintained hereafter, a carload of quarantine cattle, shipped to New York, June 18, were fed and watered; the clinical development of the disease; the gross post-mortem appearances, as detailed to me by Dr. Todd, Mr. Canfield and Mr. Booth; combined with the finding of ticks attached to cattle by at least three men,—practically decide the diagnosis.

On my return to Albany, Saturday, October 2, another set of facts bearing upon this outbreak, and in line with the above, was brought to my attention.

In the investigation at Albany and in New York State I have had the hearty co-operation of Mr. Charles A. Wieting, commis-

sioner of agriculture, and Mr. G. D. Flanders, assistant commissioner, who detailed Dr. Wm. H. Kelly of Albany, N. Y., to investigate the outbreak for the State. Saturday noon, October 2, Dr. Kelly took me to see a patient in his private practice. A cow owned by the Little Sisters of the Poor was lying nearly dead. She was bought about ten days earlier at the West Albany stock yards, but had been in the stable seven days. She was originally owned by the Shaker Settlement near Albany, and had been around the stock yards for three or four weeks. On the Thursday preceding she had been taken violently ill with chills, and had passed red water. This cow died that afternoon, and, by arrangement made by Dr. Kelly, was post-mortemed at a rendering establishment outside the city.

This cow's muscles were bright, as if partially bled; the lungs were normal, excepting a small area in the posterior portion, which was partially hepatized; the heart was firmly contracted, its muscles being quite pale; the posterior mediastinal and the left bronchial lymphatic glands contained a few one-fifth-inch diameter caseous gritty foci of tubercular origin; the spleen was from three to four times enlarged, with the characteristic black-berry-jam appearance on section; liver much enlarged, with decided yellowish cast; gall bladder full, gall thickened; intestine with reddish or pinkish appearance; kidneys very dark on section; bladder full of dark-red urine; uterus, with black contents, showing the animal to have calved recently.

Cover-glass preparations made from the heart muscles yielded the micro-organism of Texas fever to Dr. Frothingham, October 5. Portions of the heart, liver, spleen, kidney and the entire bladder were submitted to Dr. V. A. Moore, pathologist of New York State Veterinary College, by Dr. Kelly, for examination. A close inspection of the skin discovered a single female tick *Boöphilus* *bovis*, but little more than two weeks old.

The known details of the transportation and of the outbreak of Texas fever having been given, it becomes necessary to outline the principal features of the scientific history of the disease, that the two may be compared and a working theory advanced to discover the source of disease. This presentation is founded upon the investigations of the scientific force of the United States Bureau of Animal Industry, from 1886 to 1896, and various earlier writers upon this subject.

It has long been known that cattle from the south Atlantic seaboard and Gulf coast States, though seemingly and actually healthy, had the property of infecting the ground whenever driven or transported into mountainous countries or the northern States,

so that native cattle when grazing or resting upon the infected places contracted the disease known to the United States government as Texas fever, but to farmers as "red water," "bloody murrain" or "tick fever."

The actual cause of the disease (the micro-parasite *Pyrosoma bigeminum*, Smith) was demonstrated in 1889. The proof that cattle ticks (*Boöphilus bovis* (Riley sp.) Curtice) carried this disease from one animal to another followed a year or two later.

A complete cycle of an outbreak of this disease is embraced between the time that it leaves an animal capable of infecting ground it passes over, until it destroys or runs its course in an attacked animal.

In their investigations, the Bureau authorities completely demonstrated the fact that southern cattle without ticks were incapable of spreading disease; that young ticks hatched from eggs laid by ticks plucked from southern cattle produced the disease when placed on susceptible northern cattle in from thirteen to twenty-one or more days, depending upon the age of the cattle and the temperature of the weather.

They also demonstrated that blood taken from affected cattle produced disease in young cattle, and death in older cattle in from thirteen to twenty-one days, but on one occasion eight days and on another nine days. It has been demonstrated that the appearance of the disease in northern cattle is entirely dependent upon the life-history of the cattle tick. For example: southern cattle passing through stock yards, riding in cars, driven over highways or pasturing, lose the ticks, which usually infect them, upon the ground. These ticks lay eggs beginning in from one to four days, and continuing a week. Incubation begins at once, and continues, depending mainly upon heat and moisture, from three to six weeks. Since the ovipositing is prolonged, the hatching is also prolonged. After a day or two the recently hatched ticks scatter somewhat and crawl upwards on the grass blades, sticks, or whatever is first met with. They are then ready to attach themselves to cattle, from which alone they can get the sustenance necessary to carry them to maturity. They may endure, however, in this condition for a practically indefinite time, three to four months, unless benumbed by the chilling frosts and the low average temperature of the fall months.

The home of these ticks, the country where they are practically perpetually present, unless eradicated by the efforts of farmers or agricultural processes, is coincidental with the area described above as containing cattle which may carry disease to northern cattle. The tick does not seem to be able to stand climatic con-

ditions of winter north of the thirty-seventh parallel, with few exceptions, certainly not north of the thirty-eighth. *Whenever it is found north of its usual habitat, it is because it or its parents have been transported there by cattle in the course of traffic.*

The facts that must be borne in mind when considering any outbreak in the north, and I might add within the so-called infected territory, are that cattle bearing ticks drop them; from these, young ticks emerge usually in about six weeks in warm weather; and that northern cattle usually die in from two to three weeks after they are attacked. While the time of hatching of ticks is delayed by cooler weather of spring or fall, the above epitome is essentially correct. *The time, therefore, between infection of ground and the destruction of cattle is from seven to ten weeks.*

The determination that certain cattle have died of Texas fever, — a disease that can only be communicated by their having been in places infected by cattle brought from the permanently (so-called) infected area, — points out the direction in which one must search for the source of the disease, viz., to cars, stock yards, etc.

By your direction, Mr. Chairman, I have followed up both negative and positive evidence in this connection; indeed, this has been necessary, for only toward the close of the investigation did the positive evidence present itself. Since the diseased cattle were scattered to farms from the Brighton stock yards, when there was no disease in other cattle with which they mingled, it became evident that they must have contracted it before being separated.

On looking back at the date concerning the second carload lot, it will be seen that cattle died *eight* days after they arrived at Brighton; also that one cow died in *nine* days after in the first carload, and three in the third carload within *ten* days after arrival.

A reference to the experiments relating to the time of death from the disease after ticks have been placed upon cattle show it to be thirteen days or more. My own investigations have shown that deaths have occurred in outbreaks as soon as eleven days after exposure; but this is exceptional. In blood inoculation, where blood was transferred from diseased cattle directly to sound, death in one instance alone was unexpectedly produced in eight days; in another, in nine days. As a rule, the time is about the same as for tick inoculations. It is conceivable, therefore, that the disease might develop within ten days from tick inoculations, but hardly probable. Since the disease broke out in five cases in from eight to ten days after reaching the Brighton yards, infection from those yards is practically excluded. In the absence of positive infection by the proof of southern cattle having been placed in those yards, they must be regarded as uninfected.

The evidence regarding the infection of the Connecticut cattle has an important bearing. The first cow died on the eleventh day after leaving West Albany. These were standing in a pen adjacent to the first carload of cattle that went to Massachusetts on the same day. The development of the disease in the Connecticut cattle, which of course never were in the Brighton yards, serves to point to West Albany stock yards as the source of infection. However, as will be seen later, traffic in southern cattle seems to have been so loosely conducted that no yard through which such may have slipped is above suspicion when outbreaks occur in cattle which have passed through it.

In company with Dr. Kelly, I visited Watertown, Jefferson County, New York, and Little Falls, Herkimer County, whence these cattle were procured. We found at Watertown, that, according to Dr. J. R. Bell, United States government inspector at that port, not only had there been no disease of any description among the county farms, but that no cattle of any kind had been shipped into Watertown for any purpose whatever, or into the county, barring Canadian cows which are shipped *via* Cape Vincent en route to eastern points.

On this trip we investigated a rumored case in Oswego County at Vermillion, N. Y., — a case that had been reported to the New York Department of Agriculture. The cow was raised on the place, had never been off from it, nor had other cattle been brought to the place nor into the vicinity. The cow suffered from another disease.

At Little Falls we called upon Mr. William Cotter, of whom nine head of the first carload had been purchased. There had been no disease on his place or on the farms from which he purchased the cattle, nor had Buffalo or Chicago cattle been introduced.

Mr. A. L. Eaton, who lives about three miles from Little Falls, had sold six of the first carload; he is a buyer. He has a large pasture, where cattle from all parts mingle. He has not had, nor heard of, disease in cattle excepting those he sold to Mr. Smith. He had bought Buffalo cattle three months before; but according to Mr. Smith, at least part of these Buffalo cattle which he (Smith) bought died, showing their susceptibility to the disease. They did not infect the pasture, otherwise there would have been trouble before our visit. There were at the time of our visit sixty head of cattle in the pasture.

The disease could not have arisen either in Herkimer or Jefferson counties. There remains the possibility of car infection and yard infection at West Albany stock yards. I believe that infection of the Connecticut cattle at the unloading place in New Milford,

Conn., is practically excluded, for no western cattle are unloaded there, and cattle have since been unloaded there with no danger.

The possibility of car infection must be admitted until the use of each car through the entire season is proven. Since four different local cars were in use, perhaps five, infection must be pretty generally widespread, and car disinfection little practised, if due to this source. While it is my opinion that infection was not due to infected cars in any case, the possibility remains; a search of the uses to which those cars have been put will reveal whether this infection of either car has been possible. (Note: car numbers furnished by United States Bureau of Animal Industry shows no probability of car infection.)

The single cow that died in Albany was said to have been "all around the stock yards." Since she had not been in cars, her infection must have been at the stock yards, for there is no other possible source in Albany to which she had access. Quarantine cattle consigned to slaughter houses are said to be unloaded elsewhere.

A consideration of the facts regarding the treatment of the cattle at the West Albany stock yards, the time at which the disease appeared and the impossibility of their having contracted the disease earlier, forces the conclusion that they were infected at that point.

On August 1 the cattle of cars Nos. 10028, Rome & Watertown, and 22931, New York Central, were received from Herkimer and St. Lawrence counties, N. Y., and put into pens 15 and 16, alley D, respectively. They were forwarded, the first carload to Brighton, Mass., the second to New Milford, Conn., their only point of contact being when they were put into the contiguous pens. Cattle from car No. 10028 began dying in ten days thereafter, and the outbreak continued for ten days; cattle from car No. 22931 began dying in fourteen days, and continued about a week.

On August 8, cattle from car No. 10033, Rome & Watertown, were received from Jefferson County and put into pen 16 D. Some of these died between ten and fifteen days thereafter. On August 15, cattle from car No. 23015 were also received from Jefferson County and put into pen 17 D. Some of these died between twelve and fifteen days thereafter.

Of the eighty-five head in the four carloads put in pens 15, 16 and 17 at this time, forty-five died in from ten to twenty days thereafter, and the bulk of them died about fourteen days after infection.

The data pointing to the infection being in these pens accords

with the experimental evidence. The main difference seems to be that the disease is more virulent and has a quicker course when spread by natural means than artificial,—a condition which is borne out by a study of other outbreaks as well.

On July 25, Mr. Geo. Smith fed and watered a carload of cows *en route* from New York State to Brighton, Mass., at West Albany, in pen 16 D; Mr. A. W. Baggs also fed and watered a carload in pen 15 D, *en route* from New York State to Wilbraham, Mass. I further find, on consulting notes furnished by the management of the West Albany stock yards, that pen 16 D was used on July 11 and 18 by Mr. Smith. It is probable that pens 15 and 17 were also in use; indeed, the superintendent and others told me that it was the custom to open all the pens of alley D between market days, and permit cows to feed in them.

On August 15, a carload (No. 23033, New York Central) of cattle, consisting of twenty cows and three bulls, consigned to New Haven under the name of E. D. Williams, were entered into pen 16 D. Since no report of this stock has been made to Cattle Commissioner Sprague of Connecticut, and inasmuch as it was mixed stock, it is quite likely that the cattle were slaughtered in New Haven. This is the only reasonable explanation of disease not having broken out and being reported in this shipment.

If the cows that went into pens 15 and 16 D on August 1 were infected there, while other cows equally susceptible that went into these pens on July 25 were not, it is apparent that the infection became active at some period between these dates. On this supposition, we may be quite certain that the cattle ticks which were found on the cows in Massachusetts, Connecticut and Albany were hatched out, if in these pens, two or three days prior to August 1. Since these ticks do not hatch out under the most favorable conditions in less than three weeks, and under usual conditions in from five to six weeks, it is evident that the ticks from which they descended must have been dropped in these pens at from three to six weeks earlier. Three weeks prior to August 1 is July 10, and the latest date infection of pens 15 and 16 could have been expected in order to produce the disease which killed the cattle during the middle of August. Six weeks prior to August 1 is June 19, and is within a few days of the earliest date that infection probably occurred; for otherwise the cows put into these pens July 25 should have been infected from the earlier-hatched ticks.

It has been quite impossible to get a concise history of the infection of these yards, yet sufficient has been learned to incline the most sceptical to the belief that the difficulty lies in obtaining exact

proof of method of infection, rather than the fact that they were infected.

At least one possible source of infection has been discovered. On June 19, the books of the stock yard company show that a carload of seventy-eight calves, one dead (car No. 22989, New York Central), *en route* from Buffalo to New York, were stopped off and put into pen 15 D. The way-bill of the railroad company shows that a car No. 23033, with a similar consignment, was stopped off at the yards June 18. This way-bill was marked "quarantined cattle," showing them to have been cattle from the cattle-tick area. These calves were held in Albany until the 24th of June, awaiting a better market. According to the most reliable testimony Dr. Kelly and myself could get, some of these were at least yearlings, and were transferred certainly to pen 17 D. Our notes taken at the time of investigation show this. While I am of the opinion that the same testimony showed that these calves went into pens 15 and 16 D in turn, Dr. Kelly thinks not. However, the fact that the stock yards company received quarantine cattle into alley D, pens 14, 15 and 17, and harbored them about five days, is fully established.

NOTE. — Copy in part of letter from Dr. Kelly to Dr. Curtice: —

Oct. 25, 1897.

Dr. COOPER CURTICE, *Moravia, N. Y.*

DEAR SIR: — I sent you, on Friday evening, a *Boophilus Bovis*, which was taken by Mr. Rand, in my presence, from neck of a native horse, weighing about 1,400 pounds. This horse has been allowed to pasture in alley D and the yards adjoining, with the pony (from which the two-weeks-old ticks were taken), together with a number of colts. This accounts for the manner in which the ticks got on the pony. The pony referred to was purchased in Buffalo some time in August, and was shipped direct to West Albany, where it has been kept, and is still here. A portion of the time it has been kept in the barn, allowed to pasture in alley D and yards adjoining, and the balance of the time in the barn where it is at present. I am now satisfied that this pony picked up these ticks in alley D. I intend to look on the colts which pastured there at the time the horse and pony did, and will see if I cannot find more ticks. I do not know as *it has ever been proved* before that ticks would develop upon a horse, but certainly here is a case where they have.

In reference to yards 15 and 16, since we have found that the other carload of calves (No. 22989) were quarantined cattle, explains how these yards were infected. Since receiving the list from Washington, the railroad company corroborates it, and the cars Nos. 23033 and 22989 are correct. No. 22989 contained ninety-six live and two dead calves, as stated before. Both of these cars were unloaded, and the calves were

fed and kept at West Albany, in alley D and yards adjoining (15, 16 and 17).

I think we have now clear proof of how the yards in alley D, 14 to 17, inclusive, were infected. It should certainly be a lesson that in the future more care should be taken in the way that quarantined cattle are handled.

(Signed)

WM. HENRY KELLY.

On June 19 there is record of a consignment of eight carloads of Chicago cattle to W. H. Munroe, Brighton, Mass., *via* West Albany. The cars used were Boston Live Stock Express Nos. 53, 89, 81, 51, 67, 21, 39 and 45. The first four were shipped east, according to the Boston & Albany Railroad books, on June 20; the second four, on June 21. The latter four cars at least were unloaded at the West Albany yards. Cattle from this lot were put into pens 3 and 4, alley E, and 15 and 16, alley D.

On June 23 a consignment of thirty-six steers was received at West Albany stock yards, *en route* for Brighton, Mass., W. H. Munroe consignee. These came in cars Boston Live Stock Express Nos. 19 and 64. On the 26th, eighteen head, the rest having been sold in Albany, were reshipped in car Boston Live Stock Express No. 58. These were said to have been put into shed No. 26. The above is from stock yard notes.

The railroad notes give four cars of steers, Boston Live Stock Express Nos. 73, 70, 19 and 64, showing some confusion between the two. These shipments to Munroe were not recorded as quarantine cattle, but comprise, with the Harrington shipment of calves (?), the only lots that Dr. Kelly and myself could find record of up to the present time, October 10, which could possibly have infected the suspected yards.

On June 17, W. H. Munroe, Brighton, Mass., consigned in Burton's stock car No. 55 a carload of quarantine cattle from Chicago to Boston. These were said to have been sold in Buffalo, and not to have reached Boston. The coincidence of the dates of shipment of the eight carloads and this carload suggest the possibility of mixing at Buffalo of the two lots, and the subsequent contamination of pens 15 and 16 by the quarantine cattle. Thorough investigation alone will determine the fact.

The thorough investigation of what has happened to each carload of quarantined cattle that has been shipped through Albany under the supervision of the United States Bureau of Animal Industry has been delayed even to the present time, October 11, on account of the delayed answer from the Bureau in reply to the request of Assistant Commissioner Flanders for the data relating

to such shipments. Dr. Kelly will make the investigation for New York State when the advices are received, and furnish you with a report thereon.

There is no unloading chute or quarantine pen now at West Albany; whatever quarantine cattle are unloaded there must be unloaded into the common stock-yard pens, and either driven directly for slaughter or taken into the pens used by other cattle. There is a tradition commonly entertained by the older stockmen that there was once a separate chute and pens for such cattle, but that these became old and decayed, and were finally pulled down as being of no more use.

The destruction of cattle by a contagious disease contracted in the progress of conveyance from one State to another naturally arouses the question of responsibility in the minds of the losers of those cattle.

The question which confronts your Board is, How may future outbreaks be prevented? This question is one which interests every northern State which is likely to receive southern cattle in the summer time. While the question of legal responsibility may never be taken up or pushed to a conclusion, that of responsibility for taking necessary steps to prevent future outbreaks may readily be arrived at.

The heavy losses in cattle due to Texas fever prior to 1889, and the attitude assumed by States in quarantining against the admission of southern cattle within their boundaries or their passage *en route* to other States, and the accompanying interruption of cattle traffic, led to the quarantine by the United States Department of Agriculture of all cattle south of a stated line, and their assuming oversight of all cattle transported from that area for immediate slaughter until they had been delivered into pens set apart for them at their destination. The line was established on the clinical evidence obtained by earlier investigation, and has been subject to subsequent revisions. The quarantine was found to be of such commercial utility that it has since been annually proclaimed.

The proclamation for the current year is : —

Regulations concerning Cattle Transportation.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
WASHINGTON, D. C., Jan. 27, 1897.

*To the Managers and Agents of Railroads and Transportation Companies
of the United States, Stockmen and Others.*

In accordance with section 7 of the act of Congress, approved May 29, 1884, entitled "An act for the establishment of a Bureau of Animal

Industry, to prevent the exportation of diseased cattle, and to provide means for the suppression and extirpation of pleuro-pneumonia and other contagious diseases among domestic animals," and of the act of Congress which became a law April 24, 1896, making appropriation for the Department of Agriculture for the fiscal year ending June 30, 1897, you are hereby notified that a contagious and infectious disease, known as splenic or southern fever, exists among cattle in the following-described area:—

All that country lying south, or below, a line beginning at the north-west corner of the State of California; thence east, south and south-easterly along the boundary line of said State of California to the south-eastern corner of said State; thence southerly along the western boundary line of Arizona to the south-west corner of Arizona; thence along the southern boundary lines of Arizona and New Mexico to the south-eastern corner of New Mexico; thence northerly along the eastern boundary of New Mexico to the southern line of the State of Colorado; thence along the southern boundary lines of Colorado and Kansas to the south-western corner of Kansas; thence southerly along the western boundary line of Missouri to the south-western corner of Missouri; thence easterly along the southern boundary line of Missouri to the Mississippi River; thence northerly along the Mississippi River to the northern boundary line of Tennessee at the north-west corner of Lake County; thence easterly along said northern boundary line to the north-east corner of Henry County; thence in a northerly direction along the boundary of the Tennessee River to the north-west corner of Stewart County; thence in an easterly direction along the northern boundary of Tennessee to the south-western corner of Virginia; thence north-easterly along the western boundary line of Virginia to the northernmost point of Virginia; thence southerly along said boundary line to the north-east corner of Virginia, where it joins the south-eastern corner of Maryland at the Atlantic Ocean.

Whenever any State or Territory located above or below said quarantine line, as above designated, shall duly establish a different quarantine line, and obtain the necessary legislation to enforce said last-mentioned line strictly and completely within the boundaries of said State or Territory, and said last above-mentioned line and the measures taken to enforce it are satisfactory to the Secretary of Agriculture, he may, by a special order, temporarily adopt said State or Territorial line.

Said adoption will apply only to that portion of said line specified, and may cease at any time the Secretary may deem it best for the interest involved, and in no instance shall said modification exist longer than the period specified in said special order; and at the expiration of such time said quarantine line shall revert without further order to the line first above described.

Whenever any State or Territory shall establish a quarantine line for above purposes, differently located from the above-described line, and shall obtain by legislation the necessary laws to enforce same completely and strictly, and shall desire a modification of the Federal quarantine line to agree with such State or Territorial line, the proper authorities

of such State or Territory shall forward to the Secretary of Agriculture a true map or description of such line and a copy of the laws for enforcement of same, duly authenticated and certified.

Such States or Territories as now have a line established as last above mentioned can immediately forward certified copies of said line and laws for the enforcement thereof; and, if satisfactory to the Secretary of Agriculture, the same may be adopted at once, and the Federal line so modified.

From the fifteenth day of February to the fifteenth day of November, inclusive, during each year, no cattle are to be transported from said area south or below said Federal quarantine line above described to any portion of the United States above, north, east or west of the above-described line, except by rail for immediate slaughter, and when so transported the following regulations must be observed: —

1. When any cattle in course of transportation from said area are unloaded above, north, east or west of this line, to be fed or watered, the places where said cattle are to be fed or watered shall be set apart, and no other cattle shall be admitted thereto.

2. On unloading said cattle at their points of destination, pens, sufficiently isolated, shall be set apart to receive them, and no other cattle shall be admitted to said pens; and the regulations relating to the movement of cattle from said area, prescribed by the cattle sanitary officers of the State where unloaded, shall be carefully observed. The cars that have carried said stock shall be cleansed and disinfected as soon as possible after unloading and before they are again used to transport, store or shelter animals or merchandise.

3. All cars carrying cattle from said area shall bear placards stating that said cars contain southern cattle, and each of the way-bills of said shipments shall have a note upon its face with a similar statement. Whenever any cattle have come from said area and shall be reshipped from any point at which they have been unloaded to other points of destination, the cars carrying said animals shall bear similar placards with like statements, and the way-bills be so stamped. At whatever point these cattle are unloaded, they must be placed in separate pens, to which no other cattle shall be admitted.

4. The cars and boats used to transport such animals, the chutes, alleyways and pens used during transportation, and at points of destination, shall be disinfected in the following manner: —

- (a) Remove all litter and manure. This litter and manure may be disinfected by mixing it with lime or saturating it with a five per cent. solution of carbolic acid; or, if not disinfected, it may be stored where no cattle can come into contact with it until after November 15.

- (b) Wash the cars and the feeding and watering troughs with water until clean.

- (c) Saturate the walls and floors of the cars, and fencing, troughs and chutes of the pens with a solution made by dissolving four ounces of chloride of lime to each gallon of water; or disinfect the cars with a jet of steam under a pressure of not less than fifty pounds to the square inch.

Cattle from the Republic of Mexico may be admitted into the United States to remain below said Federal quarantine line after inspection, according to law; but said cattle shall not be permitted to cross said quarantine line otherwise than by rail for immediate slaughter, except by special permit from the inspectors of the Bureau of Animal Industry, issued according to the regulations of the said Bureau; and no permit shall be issued except for cattle free from splenetic, or Texas, fever, or from contact therewith during the three months preceding the issuance of said permit, and which have been grazed in a locality free from infection of such fever.

Notice is hereby given that cattle infested with the *Boöphilus bovis*, or southern cattle tick, disseminate the contagion of splenetic, or southern, fever (Texas fever); therefore cattle originating outside of the district described by this order or amendments thereof, and which are infested with the *Boöphilus bovis* ticks, shall be considered as infectious cattle, and shall be subject to the rules and regulations governing the movement of southern cattle.

Stock yards companies receiving such cattle shall place the same in the pens set aside for the use of southern cattle, and transportation companies are required to clean and disinfect all cars and vessels which have contained the same, according to the requirements of this department.

The losses which formerly occurred to the owners of susceptible cattle, both in the interstate and export trade, by the contraction of this disease from exposure in unclean and infected cars and pens, and by means of the manure carried in unclean cars from place to place, became a matter of grave and serious concern to the cattle industry of the United States, until this danger was removed by the inspection of this department. It is absolutely essential, therefore, that this cattle industry should continue to be protected as far as possible by separating the dangerous cattle and by the adoption of efficient methods of disinfection.

Inspectors are instructed to see that disinfection is properly done, and it is expected that transportation and stock yards companies will promptly put into operation the above methods.

All prior orders conflicting herewith are hereby revoked.

J. STERLING MORTON,
Secretary.

The restriction placed upon traffic in cattle for feeding purposes and the comparatively complete separation of infected cattle from the others in the large stock yards of this country, cut down losses from this source to a minimum, yet outbreaks resulting in a total of thousands of dollars' loss have since annually occurred, due to evasions of the law along the quarantine line and in unprotected places.

In the present instance the loss was brought about by the unloading of quarantine cattle into pens used by other cattle and by admitting other cattle thereto, in direct violation of Regulation No. 2.

This, perhaps, was unintentional by the owner of the cattle, who merely wished to profit by an expected rise in the New York market; but the breaking of the regulations exists. It certainly was overlooked by the railroad men and ignored by the stock yard men.

I find that most carloads of cattle are shipped through from Buffalo to Boston, or New York. This run requires more than twenty-eight hours; it being claimed that cattle are often twenty-two hours in reaching Albany. It is rumored about the stock yards there that little attention is paid to the fact whether cattle are twenty-eight hours *en route* or forty-eight, further than it is for the profit of the stockman to care for his cattle.

Sections of the Revised Statutes referring to the Transportation of Animals.

SECT. 4386. No railroad company within the United States whose road forms any part of a line of road over which cattle, sheep, swine or other animals are conveyed from one State to another, or the owners or masters of steam, sailing, or other vessels carrying or transporting cattle, sheep, swine, or other animals from one State to another, shall confine the same in cars, boats, or vessels of any description *for a longer period than twenty-eight consecutive hours*, without unloading the same for rest, water and feeding, *for a period of at least five consecutive hours*, unless prevented from unloading by storm or other accidental causes. In estimating such confinement the time during which the animals have been confined without such rest on connecting roads from which they are received shall be included, it being the intent of this section to prohibit their continuous confinement beyond the period of twenty-eight hours, except upon contingencies hereinbefore stated.

SECT. 4387. Animals so unloaded shall be properly fed and watered during such rest by the owner or person having the custody thereof, or in case of his default in so doing, then by the railroad company or owners or masters of boats or vessels transporting the same, at the expense of the owner or person in custody thereof; and such company, owners, or masters shall in such case have a lien upon such animals for food, care, and custody furnished, and shall not be liable for any detention of such animals.

SECT. 4388. Any company, owner, or custodian of such animals who knowingly and willingly fails to comply with the provisions of the two preceding sections, shall, for every such failure, be liable for and forfeit and pay a penalty of not less than one hundred nor more than five hundred dollars. But when animals are carried in cars, boats, or other vessels in which they can and do have proper food, water, space, and opportunity to rest, the provisions in regard to their being unloaded shall not apply.

SECT. 4389. The penalty created by the preceding section shall be recovered by civil action in the name of the United States, in the circuit or district court of the United States, holden within the district where the violation may have been committed, or the person or corporation

resides or carries on its business; and it shall be the duty of all United States marshals, their deputies and subordinates, to prosecute all violations which come to their notice or knowledge

If the humane federal law requiring cattle to be unloaded at the end of each twenty-eight hours' confinement for feeding and watering is to be carried out, then many quarantine cattle must be unloaded at Albany. In this connection the shipment of quarantine cattle for slaughter to Albany and other points in New York and Massachusetts, where no federal office is located, must be considered. These cattle, of which in different years there are varying numbers, are delivered at any station and then driven to slaughter houses without supervision. Many cars are taken to other points, to be used without, so far as can be learned, any attempt or pretence at disinfection. These conditions continually expose the native cattle of these States, and, I may add, of other States, to attacks of Texas fever. The responsibility for the spread of disease by carloads of quarantine cattle which go to places where there are no pens set apart to receive them, and no provisions to adequately disinfect cars according to the regulations, or for attending to the enforcement of these regulations, lies with the officers of the Bureau of Animal Industry, who are charged with the enforcement of the law. The States are not responsible for the spread of disease until the cattle leave those places set apart for them to go to slaughter.

The Bureau authorities are aware that, when cattle are released from Chicago or Buffalo, consigned to Brighton or New York, or to a place in Massachusetts where there is no quarantine yard, these cattle may be unloaded at Albany, and that most of them in accordance with the twenty-eight-hour unloading law must be unloaded there, or they will be unloaded at some other place where there are no quarantine regulations or pretence at any. They have hitherto read their instructions as concerning the larger stock yards for the protection of the foreign and domestic cattle trade, and trusted to the exclusion of quarantine cattle for pasturage purposes to prevent disease in our own country. They have regarded their duties as ended when cattle were properly entered and released from the yards where their agents are stationed. They have overlooked the fact that cattle have been released to points where conclusive evidence was easily obtainable that their laws were not, and could not be, complied with as regards the released shipments. They have apparently made no effort to ascertain the fact whether quarantine cattle were being handled properly at such an important point as Albany, where quarantine

cattle are received *en route* and for immediate slaughter, and native cattle received and distributed to adjoining States. They have made no effort, that can be ascertained, to enforce the disinfection of cattle cars used in carrying quarantine cattle when these are unloaded at points where there are no officers.

The oversight of quarantine cattle until they are put into pens set apart to receive them cannot be relaxed on account of State laws permitting otherwise; for interstate relations are such that, as in the present case, an outbreak may occur in other States, due to relaxed precautions.

Suppose, in the present case, quarantine cattle had been unloaded into either or each of the cattle pens at Watertown, Norwood and Herkimer, N. Y., the native cattle would have been exposed in these places in New York State, and have died in Massachusetts and Connecticut. It cannot be said of any cattle pens in the United States that they will not be used for cattle in interstate traffic. They are built for cattle traffic, and cattle are shipped to and fro with no thought of State lines.

The duties of the federal authorities should be terminated only after they have delivered the cattle into pens set apart *en route*, or at their destination, and they have overseen the disinfection of the cars. If they cannot attend to this, they should refuse to release quarantine cattle destined to unprotected points. Having fulfilled their obligations in the delivery of quarantine cattle, they should then notify the State authorities that such are delivered, and turn their care over to them. Then they will have freed themselves from the responsibility of having delivered disease-breeding, proscribed cattle into an unsuspecting community; and the State may make suitable regulations for their handling, should they desire to receive them.

The conditions followed at present would be paralleled if United States authorities should convey with all possible care a carload of yellow-fever patients to some more or less important communities in our States, and quietly infect places where other people would contract the disease. The practice is indefensible and inexcusable. The wording of the United States agricultural regulations, quoted above, shows that they think it is.

There are other unavoidable conditions in railroad traffic that have heretofore spread Texas fever, and may again. Accidents delay cattle trains; sometimes cattle cars become broken *en route*, and the cattle either released violently or compulsorily. When such happens, places where this occurs should be quarantined by the State after notification by federal officers.

Another condition prevailing in other States through which the

quarantine line is drawn has a remote bearing upon the cattle traffic in Massachusetts. Prior to 1896 the shipment of cattle from infected areas in Virginia to any point outside was comparatively easy, both by cars and by driving the cattle across the line on foot, and then shipping them, — each of which was against the law. Since then, however, a more stringent State law, better enforced, has quite stopped such shipments. During the present year, however, quarantine restrictions put in force by the State of Illinois against Tennessee and Arkansas on account of disease transported from those localities show the incomplete enforcement of the quarantine line in those States. This condition of affairs along the line will more or less menace the cattle industry until the States enter into hearty co-operation in enforcing State and federal laws. At any time under such conditions the State of Massachusetts might be invaded, but on account of the nature of traffic at rare intervals. The possibility of infection from such source of some of the eight carloads of cattle bought at Chicago by W. H. Munroe, and stopped *en route* to Brighton at West Albany, is suggested.

In thus laying the responsibility for the spread of Texas fever at the door of the Bureau of Animal Industry, I do not intend in any way to exonerate railroad officials, stock yard companies or cattle men who knowingly or unwittingly override the law, but to draw attention to the first source, where the law may be more thoroughly carried out, and thus prevent infractions by others concerned. Those interested in cattle traffic in quarantined animals cannot be blamed too harshly for violations, when officials permit cattle to be released to points under conditions in which the law must be violated.

The laws of Massachusetts do not seem to have been violated in the recent outbreak by the introduction into the State of any disease-bearing cattle. The diseased cows introduced died. But one recovered animal was found to bear a single tick, and this at so late a date that the young could not possibly hatch out for infection of other cattle.

An examination of the method of handling cattle at the Brighton yards, the unloading of all quarantine cattle at the Brighton abattoir and the complete absence of data showing infection of these yards indicate that no infection has been in these yards this year. The quarantine imposed by the United States authorities may have been justified so long as suspicion attached to these yards in the course of investigation, but no longer. Unless it can be shown that the United States authorities had reason to suspect that infected cattle had passed through these yards in June, or the

first week in July, the quarantine was unjust, for the history of the outbreak pointed to an infection of the cattle before they passed through these yards. The only protection the State of Massachusetts has against future recurrence of losses from this disease is the insistence upon federal authorities carrying out the regulations of the United States Department of Agriculture in other States and in Massachusetts, or on the entire exclusion of such cattle from Massachusetts. The traffic for the present year is so inconsiderable that it may well be stopped, in view of the loss to the State that it might produce.

The laws of Massachusetts bearing on this point are as follows:—

SECT. 53. When animals are transported within this state from localities beyond its boundary lines, which localities the board of cattle commissioners deem to be infected, such animals may be seized and quarantined by the commissioners at the expense of the owners or consignees thereof, so long as the public safety may require; and if, in their judgment, it is necessary to secure that safety, they may cause such animals to be killed without appraisal or payment for the same

SECT. 54. No Texan, Mexican, Cherokee, Indian or other cattle, which the cattle commissioners decide may spread contagious disease, shall be driven on the streets of any city, town or village, or on any road in this Commonwealth, nor shall they be driven outside the stock yards connected with any railway in this Commonwealth contrary to any order of the board of cattle commissioners.

SECT. 55. In all stock yards within this Commonwealth said Texan, Mexican, Cherokee, Indian or other cattle, which the cattle commissioners decide may spread contagious disease, shall be kept in different pens from those in which other cattle are kept

SECT. 56. Any person or persons violating any of the provisions of the two preceding sections shall be punished by a fine of not less than twenty nor more than one hundred dollars.

SECT. 37. Contagious diseases under the provisions of this act shall include glanders, farcy, contagious pleuro-pneumonia, tuberculosis, Texas fever, foot-and-mouth disease, rinderpest, hog cholera and rabies.

In the recent outbreak the action of the Cattle Commissioners of Massachusetts and Connecticut in cautioning buyers from bringing their cattle through the West Albany stock yards, or from New York, until the source of disease was located, was all the protection these States had. Though necessarily tardily taken, it probably prevented some loss. The fact that but few cattle passed through the infected yards prevented more loss. The final quarantine of the suspected pens by the New York authorities did not occur until the 5th of October, for the reason that they did not

wish to take action until the fact was proven that the cows did become infected in the suspected pens. In yards transacting any considerable business such delay would be productive of great loss.

The federal authorities have depended upon the New York State officials for an investigation and action, and have not investigated the outbreak outside of the Brighton yards. The tardy action of States in investigating such outbreaks should not be awaited for by the federal officers when interstate traffic is involved, and federal laws, over which they alone have supervision, have been violated. Had it not been for the investigation ordered by your own State, the source of infection would not have been definitely decided; each State involved would have believed the other at fault, and no relief against future outbreaks been proposed.

Résumé.

1. The outbreak of disease which destroyed at least thirty-five head out of fifty-eight cows transported from New York State to eastern Massachusetts was due to Texas fever, contracted in the stock yards at West Albany, New York.

2. The infection of the West Albany stock yards was due to the illegal unloading and detention of quarantine cattle in those yards, and presumably to a carload (or two) of quarantined young stock shipped from Chicago to New York, and detained about five days in said yards.

3. Future outbreaks may be prevented by the complete enforcement of United States laws by officers of the United States Bureau of Animal Industry, and the notification of the State Cattle Commissioners concerning the unloading of quarantine cattle into pens set apart for them by those officers.

4. The present State law relating to the unloading of cattle which may spread Texas fever seems adequate for all purposes, and, if carried out, will prevent Texas fever spreading from cattle delivered into "places set apart."

5. The investigation undertaken by the Cattle Commissioners will have been justified when adequate steps are taken to prevent future outbreaks; then Texas fever, as a disease of northern cattle, will become an historical reminiscence.

COOPER CURTICE.

The existence of Texas fever in Massachusetts this summer was first called to the attention of the Board of Cattle Commissioners by Commissioner Dennen, who had three cows, bought in Brighton, — two from the carload arriving

August 2, one from the carload arriving August 9, — which sickened and died.

Specimens from the spleens and kidneys of two of these cows were examined by Dr. Langdon Frothingham, and the organism of Texas fever found to be present; the diagnosis was confirmed by Dr. Theobald Smith.

As soon as it became clear to the Cattle Commission that it had an outbreak of Texas fever to deal with, the following notice was sent to the principal shippers of cattle from New York State into Massachusetts: —

COMMONWEALTH OF MASSACHUSETTS.

BOARD OF CATTLE COMMISSIONERS,
COMMONWEALTH BUILDING, BOSTON, Aug. 27, 1897.

DEAR SIR: — It having come to the notice of the Massachusetts Cattle Commission that cows brought from certain localities in New York State, and sold at Union Market, Watertown, and the stock yards, Brighton, have in some instances died of Texas cattle fever after being taken away by purchasers, we would notify you of the above facts, and warn you against bringing in any cattle from New York State until the 1st of October, except beef cattle to be killed at the slaughter houses.

Yours truly,

AUSTIN PETERS,
Chairman.

The leading agricultural papers were also requested to make the matter public, which they did at once, and intending purchasers were informed that there was a risk in buying New York State cows. The result was that the importation of cattle from New York State into Massachusetts was practically stopped for the time being, and it became pretty certain that the trouble was traceable to the stock yards at West Albany; such cattle as were shipped into Massachusetts from New York State were sent around a northern route by way of the Vermont Central Railroad, until the weather became so cold that there was no more danger to cattle coming through the West Albany stock yards.

Owing to these precautions, the loss of animals was confined to the three carloads mentioned in Dr. Curtice's report.

From Dr. Cooper Curtice's report it may be seen that the point where the New York State cows became infected was

at West Albany, and before it was even decided to employ him to investigate the outbreak it is clear that the Massachusetts Cattle Commissioners were right in being of the opinion that the disease was not contracted in this State; however, upon learning that there was an outbreak of Texas fever in Massachusetts, the chief of the Bureau of Animal Industry at Washington telegraphed to Dr. D. D. Lee at Boston, the veterinarian having charge of the Bureau's work at this port, under date of September 2, quarantining the Brighton yards against export cattle.

Later, when it became evident that the animals that afterward died had only been in pens 11 and 13 on Texas Street, and pens 33 and 35, known as J. S. Henry's pens, on Front Street, the quarantine was changed on September 23 to include only these four pens, until further notice. This quarantine upon the four pens has not been officially removed, but expired on November 15 by the time limit in the proclamation of the Secretary of Agriculture defining the infected area, extending from February 15 to November 15.

By advice of Dr. Curtice after he commenced his investigation of the outbreak, four cows were bought and kept in pens 11 and 13, to determine whether or not they were infected.

There was no necessity for experimenting with pens 33 and 35 on Front Street, as J. S. Henry sells cattle from other points that pass through these pens every week, and there is no record of any creatures dying of Texas fever this season that passed through his pens except from the three carloads that came from New York State through the West Albany stock yards last August.

The New York State cattle were first unloaded into pens 11 and 13, Texas Street, and in this respect were handled differently from any other cattle consigned to Mr. Henry; and as steers for slaughter also pass through pens 11 and 13, there was more reason for considering these pens a possible source of danger.

After buying these cows, two were kept in pen 11 and two in pen 13 from September 28 until October 15, when they were removed to a shed on the same street that had not

been used for cattle. Here they were kept for eighteen days, their temperature being taken daily, as follows:—

DATE.		No. 1. Red Cow, White on Udder.	No. 2. Red Cow, Balls on Horns.	No. 3. Black and White Cow, Middle of Tail White.	No. 4. Black and White Cow, Half of Tail White.
		Degrees.	Degrees.	Degrees.	Degrees.
October	15, . .	102	102 $\frac{4}{5}$	102 $\frac{1}{5}$	102 $\frac{2}{5}$
	16, . .	101	101 $\frac{3}{5}$	101 $\frac{2}{5}$	101 $\frac{1}{5}$
	17, . .	101 $\frac{3}{5}$	101 $\frac{4}{5}$	101 $\frac{4}{5}$	102
	18, . .	101	100 $\frac{4}{5}$	101	102
	19, . .	101	101	101 $\frac{3}{5}$	101 $\frac{3}{5}$
	20, . .	101	100 $\frac{3}{5}$	101 $\frac{1}{5}$	101
	21, . .	100 $\frac{4}{5}$	100 $\frac{2}{5}$	101 $\frac{2}{5}$	101
	22, . .	100 $\frac{2}{5}$	100 $\frac{2}{5}$	101	100 $\frac{3}{5}$
	23, . .	100 $\frac{4}{5}$	99 $\frac{4}{5}$	100 $\frac{2}{5}$	100 $\frac{2}{5}$
	24, . .	101	100 $\frac{1}{5}$	100 $\frac{3}{5}$	100 $\frac{4}{5}$
	25, . .	101 $\frac{2}{5}$	101 $\frac{1}{5}$	101	100 $\frac{3}{5}$
	26, . .	99 $\frac{4}{5}$	100 $\frac{2}{5}$	100 $\frac{3}{5}$	102
	27, . .	101 $\frac{3}{5}$	100 $\frac{1}{5}$	101	101 $\frac{1}{5}$
	28, . .	101 $\frac{4}{5}$	100 $\frac{2}{5}$	99 $\frac{4}{5}$	101
	29, . .	101	100 $\frac{2}{5}$	101 $\frac{1}{5}$	100 $\frac{2}{5}$
	30, . .	101 $\frac{2}{5}$	100 $\frac{1}{5}$	100	101
	31, . .	101 $\frac{1}{5}$	101	100 $\frac{2}{5}$	101 $\frac{2}{5}$
November	1, . .	101	101 $\frac{1}{5}$	101	100 $\frac{4}{5}$

At the end of this time the cows were sold, having remained in apparently perfect health; and during the latter half of this period, when the temperatures were taken daily, it can be seen by the above table that these remained normal.

To be still further positive that there has been no infection from the Texas fever organism, Dr. Langdon Frothingham,

a few days before the animals were sold, made cover-glass preparations of their blood, and under date of November 4 reports that he was unable to find any of these organisms in their blood.

It is therefore clear that the source of infection was at the West Albany stock yards. These stock yards became infected because there is no provision for furnishing separate chutes and pens for quarantine cattle, as required by the rules and regulations of the Bureau of Animal Industry; and there is no agent of the Bureau of Animal Industry there to see that these rules and regulations are enforced.

Notwithstanding the fact that suspicion pointed much more strongly to the West Albany stock yards as the infected area, as will be seen from the information gathered by the Massachusetts Cattle Commission, yet for some reason the Bureau of Animal Industry chose to place the odium on the stock yards at Brighton, ignoring the West Albany stock yards, if a quotation from a letter of Dr. Cooper Curtice is correct. He writes, under date of December 8, as follows: —

The only step that the Bureau took regarding the outbreak was to quarantine the Brighton yards. Up to October 14, or since, for that matter, the Bureau took no measures to ascertain where the disease was disseminated in this State (New York State), other than to call it to the attention of the New York Commissioner of Agriculture, about the middle of September, and, I believe, ask him to investigate. No quarantine of those West Albany yards was attempted until after frosts began, — early in October; then the assistant New York commissioner sent Dr. Kelly out there, to tell them that, if they continued to admit cattle to alley D and its pens, he would quarantine the whole yards.

While not a legal procedure, it perhaps accomplished its purpose. The advice of your commission to Massachusetts buyers accomplished more.

The whole matter at West Albany was handled in a very unscientific and illegal manner by both the State and the Bureau. In the first place, the yard should have been quarantined by the Bureau at the same time as the Brighton yards. In the second place, the State authorities should have quarantined on suspicion. The commissioner of New York State was, however, partially excusable, if not wholly, from the fact that the Bureau had already thrown the fault upon the Brighton yards by their act of

quarantine without further action in regard to other places, as West Albany.

Moreover, the State law is poorly drawn up, and requires such publication to be made that the department is unwilling to take steps unless the fact of infection of a given place is established. This procedure may do in some kinds of work, but not in contagious diseases. The United States Bureau of Animal Industry may take steps to prevent recurrences after Feb. 15, 1898, when a new proclamation will go into effect. They may have felt that further quarantine after the middle of October (by which time the commissioner of the New York State Department of Agriculture had taken his steps) was unnecessary. For some reason I have yet to learn of any case prosecuted by the Bureau of Animal Industry against carriers for violation of the quarantine law.

While the losses to cattle owners in Massachusetts and Connecticut were not very heavy, yet in many instances they were incurred by farmers who could ill afford to bear them; beside which, the quarantine on the Brighton stock yards caused some loss and inconvenience to the Boston & Albany Railroad Company.

It is to be hoped that such an occurrence may not be permitted to take place another season, by requiring the West Albany Stock Yard Company to fit its pens to fulfil the requirements of the Bureau of Animal Industry, and by the Bureau having an agent stationed at this important point.

In fact, Dr. D. E. Salmon, chief of the United States Bureau of Animal Industry, writes, under date of November 2, to the Massachusetts Cattle Commission, in part as follows:—

I recognize the fact that Albany is an important point to guard, and have intended to have some one stationed there next season, if possible.

ACTINOMYCOSIS.

During the year a number of cases of actinomycosis, or lumpy jaw, have occurred among the cattle of the State. This disease is caused by a fungus belonging to the mould family. These fungi are called actinomyces because of their star-shaped appearance under the microscope, and the disease is known as actinomycosis. So far as is known, it does not seem to spread to any extent from one animal to another,

but the fungus is thought to be on the grain or straw, and it is from this source that the affected animal is generally thought to acquire it.

Most commonly the primary seat of the disease is in the jaw, starting in the alveolus of a tooth. The actinomyces frequently find lodgement in the cavities caused by the shedding of the temporary or milk teeth before the permanent teeth make their appearance. In time a large bunch may develop on the face or jaw, and it was because of the nature of the changes set up in the bone that the disease got its former name of Osteo Sarcoma.

After the breaking down of the enlargement, it is possible that an animal may swallow some of the discharge containing the little yellow granules or fungous growths, and in this way secondary infection may take place. The actinomyces may also be absorbed or find lodgement in other organs of the body. For example, it seems to be possible for the fungous growth to gain an entrance at the opening of the milk duct and find lodgement in the udder. Three cases of what appear to be infection in this way have come under the observation of one of the members of the Board.

The first occurred some years ago, in New Hampshire, under the following circumstances: a heifer was noticed to be suffering from the form of actinomycosis known as "lump-jaw;" this was discharging freely, and at this time she was kept in a box stall in the farm hospital; she was finally destroyed. Shortly afterwards a sow with her litter of pigs was placed in this box, and before her pigs were weaned an enlargement began to develop on the left hind portion of the udder. It gradually grew larger, and finally broke and discharged; and because of this, the pigs were weaned and she was destroyed. The post-mortem examination showed no trace of disease except in this portion of the udder, and microscopical examination showed a beautiful specimen of the ray fungus, or actinomyces. The disease in this case was only present in the udder, the fungus probably finding its entrance through the milk duct, the active condition of this organ aiding its development.

The second case occurred in a Lawrence cow; it was quarantined under suspicion of having tuberculosis of the

udder, which was hard and nodulated to the touch. The cow was tested and condemned, and on autopsy was shown to have tuberculosis of the lung and bronchial gland; cultures from this gland were later used by Prof. Theobald Smith in some experiments with tuberculosis. The udder proved to be infiltrated with small nodules with yellow centres, which proved later to be actinomycosis.

The third case occurred at Amesbury, and was very similar to the second, the cow being condemned on physical examination because of the condition of the udder. The cow was free from disease except in this organ, and on section it was found to be studded with small minute nodules with yellow centres, not so well marked, however, as in the second case.

In both these cases, on a superficial cursory examination, this condition might easily have been mistaken for tuberculosis; but on closer inspection it was noticed that the yellowish centres were imbedded in a well-marked band of fibroid tissue. In tuberculosis small-celled proliferation with a tendency to caseation is more marked; while in actinomycosis there is usually more of a tendency to circumscribed fibrous changes, with sometimes a honeycombed structure containing small yellowish granular masses, which may often be squeezed out by the thumb nail.

In all three of these cases the udder seemed to be the initial seat of the disease, the milk duct being the possible source of infection.

Actinomycosis is by no means a typical contagious disease, in that it is not usually conveyed from one animal to another; but an animal with actinomycosis of the udder is by no means a fit animal for dairy purposes, and neither should an animal with generalized actinomycosis be passed as fit for beef.

GLANDERS.

During the past year 485 horses have been reported to the Board of Cattle Commissioners as suspected of being affected with glanders, or farcy. At the time of compiling this report, December 20, 402 had been killed, 81 had been examined and released and 2 were still in quarantine and under observation.

The following list gives the cases reported from each city and town:—

Glanders reported in 1897.

Cases in:—		Cases in:—	
Amesbury,	1	Merrimac,	1
Andover,	1	Melrose,	7
Arlington,	2	Millbury,	5
Auburn,	2	Milford,	1
Belchertown,	1	Millis,	1
Bellingham,	1	Milton,	1
Boston,	144	Montague,	2
Brimfield,	1	Natick,	1
Brockton,	1	Needham,	1
Cambridge,	29	New Bedford,	3
Canton,	1	Newbury,	1
Charlemont,	1	Newton,	2
Chelmsford,	2	Paxton,	1
Chelsea,	1	Plymouth,	1
Chicopee,	3	Quincy,	11
Clinton,	1	Randolph,	2
Concord,	1	Raynham,	2
Conway,	1	Revere,	1
Danvers,	3	Rockland,	1
Dartmouth,	1	Royalston,	1
Dedham,	1	Somerville,	22
Dighton,	1	Southborough,	1
Easthampton,	1	Springfield,	5
Easton,	2	Stoneham,	2
Everett,	6	Sutton,	1
Fall River,	16	Taunton,	1
Fitchburg,	3	Upton,	2
Foxborough,	3	Walpole,	1
Framingham,	1	Waltham,	2
Grafton,	8	Ware,	1
Groveland,	1	Wayland,	1
Haverhill,	2	Wellesley,	1
Hingham,	4	Westborough,	3
Holyoke,	4	Westfield,	8
Hopedale,	1	West Newbury,	1
Hudson,	1	Weymouth,	1
Lanesborough,	1	Winchester,	2
Lawrence,	5	Winthrop,	1
Leicester,	1	Woburn,	10
Lynn,	19	Worcester,	84
Malden,	3		
Medfield,	4		
Medford,	3		
		Total,	485

These figures show an increase of cases reported as diseased or suspicious over 1896 of 101, or of actual cases killed of 61. In last year's report it was said that there was an increase in 1896 over the cases in 1895, and this was attributed in part or whole to a better understanding of the law requiring all persons to report suspected cases to local boards of health, and requiring these boards in turn to report to the Board of Cattle Commissioners. But without any better understanding of the law the number of animals reported this year is much greater than last, and by no means represents all the cases that occur, as many horses are killed by owners who do not wish to have it known that the disease exists in their stables, and therefore they do not report it to the local board of health; and in some instances doubtless local boards of health are remiss in reporting cases to the Board of Cattle Commissioners if a horse is killed with the consent of the owner.

There is no doubt concerning the increase of glanders, and this being the case, it must be considered by what means this malady extends itself.

Glanders and farcy are one and the same disease, and it has long been acknowledged that it spreads by means of a germ which may be conveyed from horse to horse by one animal coming in immediate contact with another, by the virus being conveyed from one horse to another by means of curry-combs, brushes, harness and the like, by a healthy horse occupying a stall used by a diseased one, and in similar ways. But to account for its marked and in some ways mysterious increase the past two or three years, there must be another factor besides horses rubbing noses on the street, infected stables, and unprincipled traders in old, worn-out horses; and this factor must be the public watering troughs in our cities and towns; this was the opinion of the Board, as given in its report of two years ago, again last year and reiterated this year.

The reported cases of glanders were, in 1894, 230; in 1895, 250; in 1896, 384; and in 1897, 485; that is, the cases reported have more than doubled in the past three years, and it is probable that some of this increase is due to the public watering troughs.

In substantiation of the fact that it is possible that glanders can be conveyed into the horse's system by means of drinking water containing the glanders bacilli, it is only necessary to refer to a brief report of some experiments carried on by Mon'r Edward Nocard of Alfort, France, as given in the "American Veterinary Review" for September, by Dr. A. Liautard. For these experiments twelve cavalry horses were furnished by the Secretary of War, and placed at M. Nocard's disposal at Alfort. They were first tested with mallein, to be sure that they were free from glanders, and none reacted. Nov. 30, 1896, all of these horses were given water from a pail, each one receiving a certain well-measured quantity of culture of the glanders bacilli. A few days after, varying from four to eight days, there was noticeable a great oscillation in the temperature, indicating a febrile condition. After the eighth day, in some of them enlarged lymphatic glands were noticed, which later assumed the character of the glands noticed in glandered horses. Dec. 15, 1896, they were all tested with mallein, and all reacted. Jan. 15, 1897, all were again tested, and all reacted, although not all to the same extent as at the first test. January 21, three showed so much evidence of disease that they were destroyed.

The others were kept for further experiment, Professor Nocard wishing to see if glanders could be cured by mallein. By May there were six horses that failed to react to mallein, and in July four of these were killed; and although lesions of glanders were found, yet when these lesions were inoculated into donkeys and guinea-pigs they failed to produce disease; in other words, these horses were cured by successive injections of mallein.

These experiments are interesting, because they show that slight, undeveloped cases of glanders can be cured by repeated injections of mallein; but this does not have much to do with the question of glanders as considered here, because the wisdom of attempting to treat cases of glanders as they are reported to this Board is very questionable, and the better course seems to be to have such animals destroyed, as is at present done.

The chief interest lies in the fact that twelve horses, or

one hundred per cent. of those experimented with, could contract glanders through the alimentary canal, when the bacilli were in the water; hence proving the possibility of contaminated drinking water being a potent source of danger, — a fact that has hitherto been disputed by many able authorities. Therefore, in a locality where glanders is prevalent, the public watering troughs should have the water shut off from them; or, if these misplaced charities will not be abandoned, horse owners should on no account allow their horses to drink from them, and should forbid their teamsters to water horses at them, as well. If horses have such long hours as to need water before returning home, the teamster should be made to carry a pail, and draw water from a faucet for his horses.

If a practical demonstration is wanted of the utility of abandoning public water troughs, the history of glanders at Worcester and its vicinity the last two years will serve as an illustration. During 1896 one hundred cases of glanders were reported from Worcester; in 1897 there seemed to be no prospect of a diminution; finally, in April, it increased to such an extent that seventeen cases were reported during the month. This led to a conference between the chairman of the Cattle Commission, Mr. Herrick, Mr. Coffey, agent of the Worcester Board of Health, and the water registrar of Worcester, with the result that it was decided to close the public water troughs from May 8 to July 1. In addition, Mr. Herrick has kept the auction rooms of that city under constant surveillance, having any glandered horse found at these places killed. The result has been a falling off in the number of cases to eighty-four for the year, a marked decrease being noticed soon after having the watering troughs closed, as may be seen by the following table. Many of the cases reported as Worcester animals were horses brought in from adjoining towns by unscrupulous persons, to be sold at the Worcester auction rooms: —

Cases of Glanders in Worcester, Dec. 20, 1896, to Dec. 20, 1897.

DATE.	Con- demned.	Re- leased.	DATE.	Con- demned.	Re- leased.
December, 1896, after 20th.	1	1	August, . . .	2	1
January, 1897, . . .	5	1	September, . . .	6	1
February, . . .	8	1	October, . . .	4	3
March, . . .	4	1*	November, . . .	3	1
April, . . .	17	—	December, to 20th, .	2	—
May, . . .	10	1	Total of each, .	73	11
June, . . .	6	—	Total quarantined,	84	
July, . . .	5	—			

* Released in May, killed in October.

Total for August, September and October, 12, or 20 per cent.

It can be seen that after watering troughs were closed there was a marked falling off, and that during the dry months there was less than in April and May.

In contrast to the above table, the cases occurring in Boston, Cambridge, Somerville and Quincy, four neighboring cities, where glanders has been especially prevalent the last year, will show how it increases when horses drink the most, and just afterward, when nothing has been done to stop its spread by closing the public watering troughs (Cambridge closed a trough at East Cambridge, September 1, for about two weeks).

DATE.	BOSTON.		CAMBRIDGE.		SOMERVILLE.		QUINCY.	
	Con- demned.	Released.	Con- demned.	Released.	Con- demned.	Released.	Con- demned.	Released.
December, 1896, after 20th.	2	—	2	—	—	—	—	—
January, 1897, . . .	10	—	—	—	—	—	—	—
February, . . .	9	—	—	—	1	—	1	—

DATE.	BOSTON.		CAMBRIDGE.		SOMERVILLE.		QUINCY.	
	Con-demned.	Released.	Con-demned.	Released.	Con-demned.	Released.	Con-demned.	Released.
March,	7	—	—	—	1	—	—	—
April, }	18	1	3	—	2	2	—	—
May, }			—	—	—	—	—	—
June, }			2	—	1	—	1	—
July,	19	—	—	—	1	—	1	—
August,	14	—	10	—	7	3	2	—
September,	21	—	3	2	1	—	3	—
October,	18	—	3	—	2	1	2	1
November,	14	—	2	—	—	—	—	—
December, to 20th,	11	—	2	—	—	—	—	—
	143	1	27	2	16	6	10	1
Totals,	144		29		22		11	

Grand total, 206

Total for August, September and October, 93, or 45 per cent.

It will be seen by the two tables that during August, September and October, at Worcester, only twenty per cent. of the cases of the year occurred; while in Boston, Cambridge, Somerville and Quincy, forty-five per cent. of the cases of the year occurred during these months.

If the increase in the amount of glanders be considered from the localities where it exists, it will be found that it is largely, in fact almost wholly, confined to twenty-eight cities and towns, with Boston as a centre, and the other towns covering a territory that is continuous between them and Boston; and that in many, if not all, there are express men, teamsters and others whose teams pass almost daily to Boston and return, and who water their horses at infected watering troughs on the way, or infect the troughs with glandered animals of their own.

The following table shows that, outside of Boston and twenty-seven adjoining cities and towns, only eighteen more cases of glanders were reported in 1897 than in 1896, while within this comparatively small area there were eighty-three more cases reported than in 1896.

	1896.	1897.		1896.	1897.
Boston, . . .	125	144	Newton, . . .	5	2
Cambridge, . . .	13	29	Needham, . . .	5	1
Somerville, . . .	9	22	Dedham, . . .	5	1
Everett, . . .	2	6	Hyde Park, . . .	2	—
Chelsea, . . .	4	1	Milton, . . .	—	1
Revere, . . .	—	1	Quincy, . . .	3	11
Malden, . . .	6	3	Weymouth, . . .	—	1
Saugus, . . .	2	—	Randolph, . . .	1	2
Lynn, . . .	3	19	Rockland, . . .	—	1
Melrose, . . .	—	7	Hingham, . . .	—	4
Stoneham, . . .	3	2	Cohasset, . . .	1	—
Woburn, . . .	—	10	Scituate, . . .	1	—
Winchester, . . .	1	2	Total for Boston and 27 adjoining towns, . . .	192	275
Medford, . . .	1	3			192
Arlington, . . .	1	2	Increase of 1897 over 1896, . . .		83
Watertown, . . .	1	—			

Total for whole State, 1896, 384

Less, 192

Number of cases outside Boston and 27 adjoining towns in 1896, 192

Total for whole State, 1897, 485

Less number in Boston and 27 adjoining towns, 275

Number of cases outside Boston and 27 adjoining towns in 1897, 210

In 1897,	210
In 1896,	192
Increase for year outside these cities and towns,	18

Per cent. of glanders in Boston and 27 adjoining towns to total in State, 1896,	50
Same in 1897,	56½+
Relative per cent. of increase of glanders in, Boston and 27 adjoining cities and towns to total in State of 1897 over 1896,	6½+

During the spring of the present year the Board of Health of the city of Boston secured the passage of the following act:—

[CHAPTER 178, ACTS OF 1897.]

AN ACT RELATIVE TO ANIMALS AFFECTED WITH INFECTIOUS DISEASES.

Be it enacted, etc., as follows:

SECTION 1. Any owner, agent or other person in charge of or called to examine an animal in the city of Boston, affected with either of the diseases known as glanders, farcy or rabies, shall forthwith report to the board of health of said city the name of the owner and place of keeping of such animal.

SECT. 2. Said board, when satisfied upon examination that any animal within said city is affected by either of said diseases, shall cause such animal to be killed or otherwise disposed of.

SECT. 3. Any person violating any provision of this act shall for each offence be punished by a fine of not exceeding one hundred dollars, or by imprisonment in the house of correction not exceeding one year. [*Approved March 19, 1897.*]

The Board of Health of the city of Boston employs a competent veterinarian, and has continued the same man in the position for several years, and it is not likely that political changes will interfere with the present incumbent; even if he were removed from his place, in the present state of education and public opinion, it is more than probable that it would be filled by another equally well-educated and qualified veterinarian; therefore, the act as passed cannot be objected to, provided that the cases that occur under his jurisdiction are promptly and fully reported to this Board as soon as the animals are killed.

At the same time, this act established a precedent that might be mischievous and pernicious in the extreme, if it were secured for other cities and towns, where the conditions that exist in Boston do not obtain and are not likely to become the same. It is therefore better that the control of contagious animal diseases be continued in the hands of a central body, having knowledge of the existing conditions of domestic animals in all parts of the State, and in a position to secure and direct co-operation between different localities when necessary.

There has never been any objection on the part of the commission to having glandered horses killed by the local board of health or by the inspector of animals, if the owner was satisfied that the horse was glandered; if he is not satisfied, he should be allowed to resort to the Cattle Commission, as a court of last appeal. In any event, local boards of health should comply strictly with the law requiring all cases to be reported at once and in full to the Board of Cattle Commissioners; and a clause in the law, giving a board of health power to order horses infected with glanders and farcy to be killed, should not exempt it from this obligation.

The Board has been as prompt as possible during the year in dealing with cases of glanders, but in some instances doubtful cases have to be quarantined for some little time before a correct conclusion can be reached. In doubtful cases the most satisfactory method for arriving at a diagnosis has been the test of inoculating guinea-pigs. For a more complete account of this work, the reader is referred to Dr. Frothingham's report. (See page 120.) Mallein has been little used by this Board, and needs further use before it can be decided to just what extent it is valuable.

RABIES.

During 1897, cases of rabies, or suspected cases of rabies, continued to be reported; nineteen of these were dogs. In addition, there was an outbreak in a herd of cattle at South Hadley, in August, resulting in the loss of seven or eight cows, and possibly others in the neighborhood.

Eleven of the rabid dogs were reported during the first

three months of the year; since then, fewer cases have been heard of. It is, therefore, to be hoped that those reported early in the season were among the last of the outbreak mentioned in our annual report of 1897 as beginning in December, 1895; that it has now commenced to rapidly diminish in frequency; and that there will soon be no more occurrences of this malady in Massachusetts for several years, — when, if history repeats itself, as it does, as a rule, there will again be two or three years when this troublesome disorder will reappear.

Late in January, two cases were reported from Waltham, one of which, it was afterward ascertained, had run from Salem and was later found dead in Auburndale. The other dog's origin was unknown; but, as both seemed to have been dangerous, the following letter was sent to the boards of health of the towns through which the Salem dog may have run between that city and Auburndale, where he was found dead: —

COMMONWEALTH OF MASSACHUSETTS.

BOARD OF CATTLE COMMISSIONERS,
COMMONWEALTH BUILDING, BOSTON, Feb. 17, 1897.

To the Board of Health.

GENTLEMEN: — A dog belonging to Mr. E. S. Little of Salem bit Mrs. Little January 26, and then ran away, appearing in Waltham January 27, showing symptoms of rabies and biting several people, and probably dogs also. A few days later his body was found in Auburndale, evidently having died a few days before. Rabbits inoculated from him died of septicæmia, as he was slightly decomposed, but he was undoubtedly rabid. His course was undoubtedly a pretty direct line between Salem and Waltham, and he may have done some damage on his route.

Another dog known to have been rabid, whose origin is unknown, was killed in Waltham about January 20, after having bitten a man.

As there seems to be some danger from rabies as the result of these two cases, we consider it our duty to report the matter to you, in order that you may notify the police of your town to report to you any dogs that may be suspicious, and, if the circumstances seem to warrant it, to order dogs in your town muzzled.

Yours respectfully,

AUSTIN PETERS,
Chairman.

This letter was sent to Salem, Swampscott, Lynn, Saugus, Malden, Medford, Lexington, Belmont, Watertown, Peabody, Lynnfield, Wakefield, Melrose, Stoneham, Winchester, Arlington, Cambridge, Waltham and Newton.

As a number of cases of rabies were reported to Dr. O'Connell, at Holyoke, late in January and in February, the following letter was sent to the boards of health of Holyoke and adjoining towns : —

COMMONWEALTH OF MASSACHUSETTS.

BOARD OF CATTLE COMMISSIONERS,
COMMONWEALTH BUILDING, BOSTON, Feb. 27, 1897.

Chairman Board of Health.

DEAR SIR : — Dr. Maurice O'Connell of this Board reports an outbreak of rabies among the dogs of Holyoke. We suggest, if the circumstances seem to warrant it, that the boards of health of Holyoke and adjoining towns order dogs to be muzzled, if running at large, or kept under restraint by their owners for ninety days from this date.

The police of these towns should have orders to report dogs acting strangely to the boards of health, such dogs to be secured in a safe place and a notification at once sent to Dr. O'Connell, who will investigate the matter, and, if possible, send the bodies of dogs dying under suspicious circumstances to the laboratory of the Cattle Commission, in order to ascertain definitely whether the dog was rabid, or not.

Yours respectfully,

AUSTIN PETERS,
Chairman, for the Board of Cattle Commissioners.

The above letter was sent to Holyoke, West Springfield, Springfield, Chicopee, Westfield, Southampton, Easthampton and South Hadley.

Two cases of canine rabies were reported from Lynn, one in May the other in July. After the one in July, the Lynn board of aldermen, at a meeting July 20, upon the recommendation of the Board of Health and Inspector of Animals, passed an order that all dogs in Lynn should be muzzled until October 1.

On Aug. 25, 1897, Dr. O'Connell received a very urgent call from Mr. Myron Judd, chairman of the local board of health for the town of South Hadley, requesting him to go at once to the farm of Brown & Avery. The farm is located

in that part of the town known as Pearl City, a large portion of which is situated directly at the foot of Mt. Holyoke. In this section of the mountain it is rather woody and quite a place for hunting dogs, as fox hunters go there a great deal. He immediately went there, and found a cow, six years old, a good-looking animal. Her condition was very bad, eyes bulging, muscles twitching, striking the ground with her front feet, moaning and bellowing, frothing at the mouth, arched back, and presenting symptoms of rabies. The animal was immediately ordered quarantined.

On August 28 he was again summoned to the same farm, and found another cow presenting similar symptoms to the first. The first cow seen was found dead at this visit. The skull of No. 1 was opened, the brain removed and sent to Dr. Langdon Frothingham at the Harvard Medical College. Dr. O'Connell, having been appointed by the governor a delegate to the meeting of the United States Veterinary Medical Association, to be held in Nashville, September 7 to 10, left Holyoke on September 3, Friday evening. Before going he placed the matter in the hands of Dr. John Roberts of Northampton, a graduate of McGill University, Montreal, with instructions to keep a close watch of all the animals, and, if any of them showed symptoms of the disease, to immediately quarantine them. Upon Dr. O'Connell's arrival home from Nashville, on the 12th of September, he proceeded at once to the affected farm, and learned that four more head had died, and also that the one that was taken on the 28th was dead. Dr. Roberts reported that five of them died during Dr. O'Connell's absence, all presenting the same symptoms as the first cow.

On September 13 one more was taken sick. This cow died on the 18th, showing precisely the same actions and symptoms as the other six, making in all seven cows which there is good reason to believe had rabies. The man in charge of the farm states that he lost two more cows about two weeks previous to the first visit on August 25. He also says that the two animals acted precisely like the ones that died after the first visit. On September 23, Dr. Frothingham reported that he had made inoculations on rabbits from the brain of the diseased cow sent him, and that the rabbits

came down with the disease, showing unmistakable signs of rabies, therefore confirming the original diagnosis.

On November 23, Dr. O'Connell was called to see another cow on the same farm, showing some of the symptoms that the other cattle had shown before death, but was very much in doubt as to it being identically the same disease. Word was left with the owner, if the cow died, to notify the local inspector at once, and specimens would be taken for a second inoculation. The owner performed his part very faithfully, but the local inspector failed to report the case. About seven days after, Dr. O'Connell learned, through the commissioners of Hampshire County, that the cow had died on November 30; he proceeded at once to the farm of Brown & Avery, exhumed the carcass, and took sections of the spinal cord and shipped them to Dr. Frothingham. These specimens were, however, so decomposed that it was impossible to use them for inoculation purposes.

During the interval of the death of the last cow, September 18 to October 1, there were three or four more cows that died in an adjoining pasture, one belonging to Mr. Cameron and two to Mr. McElwain. Those cases were never reported by the local board of health or by the cattle inspector. All that is known about them is by hearsay; but it is said that their owners are to receive pay from the county commissioners out of the dog fund. The barns where these cattle were kept were ordered to be thoroughly washed with boiling water and bichloride of mercury, one part to five hundred of water. The carcasses of the animals were buried very deep, thereby preventing them from being eaten by dogs.

It is here recommended that all inspectors throughout the State, whenever such cases are reported to them, shall immediately notify the Cattle Commissioners; in fact, they are required to do so by law, as annoying complications are likely to ensue if local authorities are lax in co-operating with the Board of Cattle Commissioners in any cases that may prove to be contagious animal diseases.

In addition to the symptoms described above and the proof afforded by inoculating rabbits from the suspected cow, the cattle also had partly healed scars on the legs, such

as would result from the infliction of dog bites a few weeks previously.

In many instances so-called cases of rabies may be due to some other cause, and it is not unusual to call a dog mad and shoot him if he acts in a peculiar manner, when he may not have rabies. In doubtful cases it is much wiser to secure the dog safely until some one having knowledge of these matters can see him; and, if there is then any uncertainty, rabbits should be inoculated from the fresh medulla and cord, in order to establish a correct diagnosis. This is especially important if the dog has bitten any person or persons; as, if the animal is really rabid, the persons bitten should at once be sent to the Pasteur Institute, in New York, to undergo the protective inoculation for this fatal and terrible malady.

In questionable cases of rabies, reported to the Board of Cattle Commissioners, it has been considered wise to attempt to establish the presence or absence of the disease by having rabbits inoculated; and in a case similar to the outbreak at South Hadley, where the payment for cattle from the dog fund is involved, it becomes a very important matter to determine the exact nature of the trouble.

While it is possible a few of the cases reported to the Board of Cattle Commissioners during the past year were not rabid, yet in many outbreaks it has been proved by inoculation experiments that the diagnosis was correct, in one case that it was incorrect, and two results were neither positive or negative, owing to the decomposed condition of the material.

The following table shows the results of the inoculation proof of absence or presence of rabies:—

MONTH.	City or Town.	Animal.	Result.
January, .	Boston, . .	Dog,	Positive.
January, .	Boston, . .	Dog,	Positive.
January, .	Boston, . .	Dog,	Positive.
January, .	Waltham, . .	Dog,	Positive.
January, .	Waltham, . .	Dog,	Negative; dog ran from Salem to Auburndale; sent in by Dr. Peter- son, inspector of Waltham; rab- bits died of septicæmia.
March, .	Holyoke, . .	Dog,	Positive.
August, .	Holyoke, . .	Dog,	Negative.
August, .	South Hadley,	Cow,	Positive.
November,	Melrose, . .	Dog,	Positive.
November,	Sudbury, . .	Dog,	Positive.
December,	South Hadley,	Cow,	Negative, because material was not in condition to use; rabbits would have died of septicæmia.

The following table shows the number of cases reported during the year, either rabid, or suspected of being so : —

MONTH.	City or Town.	Animal.	Number of Cases.
January,	Boston, . .	Dog,	3
January,	Holyoke, . .	Dog,	2
January,	Waltham, . .	Dog,	2
February,	Holyoke, . .	Dog,	3
March,	Holyoke, . .	Dog,	1
May,	Lynn, . .	Dog,	1
July,	Boston, . .	Dog,	2
July,	Lynn, . .	Dog,	1
August,	Holyoke, . .	Dog,	1
August,	South Hadley,	Cow,	2
September,	South Hadley,	Cow,	5
November,	Sudbury, . .	Dog,	1
November,	Melrose, . .	Dog,	1
November,	South Hadley,	Cow,	1
December,	Wakefield, . .	Dog,	1
Total number of cases reported,			27

HOG CHOLERA.

Hog cholera seems to be a term indiscriminately applied to any disease swine may be affected with, particularly if several in a piggery are sick at one and the same time.

True "hog cholera" is a specific disease of the pig, having

ulceration of the Peyer's patches of the intestine as a characteristic lesion.

"Swine plague," so called, is a septic pneumonia of the pig, and is sometimes produced by feeding upon decomposed swill. Cases have occurred where "swine plague" has been communicated from swine to horses, sheep, lambs and calves.

Boiling the swill, where city swill is fed, will kill the germs of "hog cholera" and of "swine plague," and after it cools, skimming the grease off the top has also been advised.

Sometimes, after cooking the swill, the pigs will show evidences of "swine plague;" this is probably due to the presence of ptomanes (chemical products of a poisonous character) that have been produced by the growth and development of the septic germs before the swill is cooked.

"Hog cholera" and "swine plague" may both be present in the same pig at the same time, or either may appear in a herd of swine without being associated with the other.

Another disease that has just been brought into notice by the issuing of a recent bulletin upon the subject by the Cornell University Agricultural Experiment Station, written by Dr. Veranus A. Moore, is the poisoning of swine by washing powders and strong alkaline soaps sometimes found in the swill of hotels and public institutions.

The name "hog cholera" is often used indiscriminately by the public in designating these maladies, and a number of cases are reported every year, usually during the winter and spring months.

About the only action necessary seems to be to quarantine the premises while the outbreak lasts, forbidding the sale of swine while any sick ones are left, and advising against the introduction of new ones into the infected herd; separating the sick and well; disinfecting the premises when the outbreak is over; and cooking the swill if it comes from city supplies or public institutions. When the outbreak is over, the quarantine is raised.

Tuberculosis is not at all uncommon among swine; it is usually discovered at the time of slaughter, and is seen chiefly among pigs kept under cow barns where there are tuberculous cows, or, if the cows are diseased, in pens where

the cleanings from the cow stable are thrown, or among pigs fed offal from tuberculous cattle.

For reports upon any lesions sent in for microscopic examinations to Dr. Frothingham, either "hog cholera" or porcine tuberculosis, see Dr. Frothingham's report to the commissioners.

OTHER DISEASES.

In July an outbreak of a disease of an unknown and fatal character was reported from Edgartown. Dr. H. P. Rogers was sent to investigate the matter, July 16; later, he reported that three cows that had recently calved had died, and from what he could ascertain, he thought they had died of parturient apoplexy.

November 20, a ram was quarantined by the inspector at Chilmark, Martha's Vineyard. Dr. H. P. Rogers was sent to investigate this case also, the inspector believing the animal to have "sheep scab." Dr. Rogers reported, December 1, that the ram presented no evidence of "scab."

July 27, Mr. Freeman Hancock of West Tisbury wrote the Board concerning a bowel trouble that attacked members of his family, as the result of using milk from his cows, the first of it being in 1895. Dr. Madison Bunker of Newton was sent to investigate this matter, and made the following report:—

NEWTON, MASS., Aug. 8, 1897.

Dr. AUSTIN PETERS, *Chairman, Cattle Commission.*

DEAR DOCTOR:—In accordance with your instructions, I went to West Tisbury this week and made a visit to the farm of Freeman Hancock.

I found this to be the state of affairs, viz.: at intervals since October, 1895, there has been trouble with milk from three different cows that have been in his pasture; this trouble has been in the spring and in the fall, when the feed has been most succulent and thickest. The milk has been thick when allowed to stand, and the cream would when handled hold together and be ropy like cold molasses, — no smell, no color, no taste.

It has caused diarrhœa in the whole family, with excessive nausea in a ten-months-old child, whose stools were very fluid and very dark green. The child nearly died before the cause was ascertained; as soon as the use of this milk was stopped, recovery came in all the cases. The local physician is said to have found pus in the milk.

A change of cows has been made twice, with cessation of the trouble for some weeks or months, and then a recurrence of the trouble.

The young cow of which Mr. Hancock spoke as having had the trouble lately, has been put in the next pasture, since which time there has been no trouble with her. He has still the old cow in the pasture, but he is raising calves on her, so does not know how her milk now is. I asked him to save some of her milk, try it and report to you. The pasture is a good pasture of the kind, not very rich nor very much run out; has been used for seventy years by this family, and is a part of the location upon which the settlers built when the land was bought from the Indians by William or Thomas Mayhew. There are from seventy to one hundred acres in it. I drove over and around it, but saw no growth or weed which would give me any clue to the trouble, with the possible exception of a strip of land bordering upon a pond, into which the sea breaks, but that is not open, upon which a blue grass grows, and which had been pretty well eaten down, but whether by the cows alone or by the sheep, I could not say.

The water supply is fresh and brackish; there are water holes around the fences, one or two close to this pond, the others one-quarter of a mile away, and then some not so far. Water at barn good and free from taste; drainage away from well. Samples of both cows' milk and of pasture and barn water were taken and sent to Dr. Frothingham; also Mr. Hancock's letter to you, with a request to report to you.

My idea of the trouble is that it is all within the pasture, as when changed from the pasture the milk is all right, also when in the barn. Cows are healthy and bag of old cow OK. Young cow I did not see, as she was some distance away.

I suggested to the owner that he watch his cow as to feeding grounds, and also tramp the pasture to find any weeds. No swamp, no brush in field to cause trouble or for her to browse on.

Yours very truly,

MADISON BUNKER.

A few days later Dr. Frothingham reported upon the specimens brought by Dr. Bunker as follows:—

Boston, Aug. 13, 1897.

C. C. 77.—Milk and Water from Freeman Hancock, Martha's Vineyard.

From the report received, it seems more than probable that the trouble with Mr. Freeman's cows is referable to some poisonous substance existing in the old pasture. That this substance is of

bacterial origin is not probable, but rather some plant, the poisonous alkaloid of which is excreted in the milk. It would be next to impossible to discover the unknown alkaloid, even if the milk were chemically examined. It also seems unnecessary to undertake a detailed bacteriological examination of either milk or water.

A microscopical examination of the centrifugalized milk from the "old cow" shows a very limited number of pus cells, not enough to warrant a diagnosis of any suppurative process in the udder; less, in fact, than one often finds in the best milk.

FROTHINGHAM.

Mr. Hancock was written to, informing him of Dr. Bunker's and Dr. Frothingham's conclusions; and, as the trouble only appears when the cows are in a certain pasture, he was advised to keep them elsewhere, and use the pasture where the difficulty exists, for sheep.

At the same time, it would be interesting to know definitely what there is in this pasture that causes the milk to be unwholesome for human food, while the general health of the animals appears to be undisturbed.

Respectfully submitted,

AUSTIN PETERS, *Chairman*,
JOHN M. PARKER, *Secretary*,
MAURICE O'CONNELL,
LEANDER F. HERRICK,
CHARLES A. DENNEN,
Board of Cattle Commissioners.

APPENDICES.

APPENDIX A.

REPORT BY LANGDON FROTHINGHAM, M.D.V.

To the Massachusetts Board of Cattle Commissioners.

GENTLEMEN;—I herewith submit a report of my work from March 1 to Dec. 11, 1897. It has consisted of the examination of organs or portion of organs received from the inspectors or other agents of this commission. Where it was deemed necessary to establish the exact nature of a pathological change, not sufficiently evident by a macroscopic examination, a microscopic examination was resorted to, or inoculation. The specimens examined will be found classified in an appended table. Besides this, it has been my duty to establish the presence or absence of glanders and rabies in suspected cases by approved methods. Classified tables relating to these diseases are also appended.

TUBERCULOSIS.

The number of tuberculous lesions has not been large, and they were, as a rule, not unusual. One case of marked tuberculosis of the larynx and one of tuberculosis of the trachea are rare, because perhaps, not often sought for. The most interesting specimens were those of miliary tuberculosis of the udder, of which there were three. Such cases are doubly interesting, since it is frequently impossible to differentiate them from other udder lesions before death, and even in some instances upon the autopsy table the existence of tubercles can only be suspected; yet the microscopic examination may show minute tubercles thickly scattered throughout the gland, and it is hardly possible to conceive that in such cases tubercle bacilli do not find their way into the milk.

ACTINOMYCOSIS.

Actinomycosis of the udder, when the foci are small, may easily be confounded with tuberculosis, and a differential diagnosis is only possible by a microscopic examination. Two such cases have been examined. Actinomycosis of the lungs, when the lesions are small, may easily be mistaken for tuberculosis, if a macroscopic

examination alone is made. One such case is here reported. Only one other instance of this disease was received, and this the usual and easily diagnosticated tumor of the jaw (lump jaw).

GLANDERS.

The work in this direction has consisted in making a positive or negative diagnosis in suspected cases, according to the method of Strauss (the interabdominal inoculation of male guinea-pigs with suspected discharges). At first the material for inoculation was collected personally, but it was found more expedient for the inspector who visited such cases to obtain the suspected discharge, and bring it, as soon as possible, to the laboratory. It was, therefore, arranged that such inspector should carry with him the following: a test tube properly plugged with absorbent cotton, containing a swab of absorbent cotton wrapped about the end of a stout wire; the whole thoroughly sterilized before being placed in the inspector's hands. As much as possible of the suspicious discharge (nasal or from a farcy-bud) is collected upon this swab, at once returned to the test tube and brought to the laboratory. Here sterilized water is added, the cotton swab freed from the wire and left in the water. This is then violently shaken, until all large particles of the discharge are dissolved, the cotton squeezed as dry as possible with sterile forceps, and the solution thus obtained used for inoculation, two guinea-pigs being invariably employed. Unfortunately, the guinea-pig is not as susceptible an animal as one could desire for such work, but is the only accessible one, and if virulent glanders bacilli are present in sufficient number, the typical lesions of the testicle appear in from two to five days after inoculation. In only one instance of a positive inoculation were these lesions absent, and in this case cultures of the glanders bacillus were obtained from the spleen sixteen days after inoculation, when the animal was killed. A second guinea-pig, however, inoculated at the same time, showed the testicle lesions on the second day.

A glance at the annexed table may intimate a preponderance of negative results; but it must be remembered that these inoculations were undertaken for the purpose of diagnosis, and that these horses were only doubtful cases of glanders. The more suspicious negative cases were tested twice, to be doubly sure of the absence of glanders bacilli. One horse that gave a negative test was subsequently killed, and glanders nodules found in the lungs at autopsy; no lesions were found upon its nasal septum, however, and only a clear, watery discharge from the nose had been

obtained for inoculation. Several other negative tests were also made, where the discharge used was unsatisfactory. It is interesting to note that in all the positive inoculations the discharge was obtained from the left nostril, while in the negative inoculations the discharge was, in the majority of cases, from the right, or, as above stated, unsatisfactory. In only one positive case was a second inoculation necessary, and here because the pigs died about thirty-six hours after inoculation, of peritonitis, due to other organisms than the glanders bacillus present in the discharge.

A most interesting positive inoculation was from a man in Lynn. There was a clear history of his having a wound upon the hand, and of his constant attendance upon horses suspected of having glanders. When seen, the lesions of glanders upon the hand had healed to such an extent that it was impossible to obtain material for inoculation. At that time he had had these lesions and enlarged axillary glands for about three months. From a sluggish lesion upon the instep, however, a serous discharge was obtained, which, when inoculated into guinea-pigs, gave rapid and positive results.

RABIES.

But few cases of this disease have been investigated. They are classified in a special table. The most interesting was that of a cow, this animal being supposed to have been bitten by a dog some time before she showed symptoms of disease; and rabbits, inoculated according to the method of Pasteur, gave positive results. This cow was one where several others died in a herd at South Hadley, showing similar symptoms, and having scars of dog-bites on their legs.

TABLES.

[It is assumed that, where an organ was tuberculous, the lymphatic glands of that organ were also tuberculous. Hence in the following table only such glands are mentioned as were sent unaccompanied by other organs.]

Specimens Examined.

Cattle : —

Aberrant supra-renal tissue in the kidney,	1
Abscess of liver,	9
Abscess of udder,	2
Adenoma of pancreas,	1
Actinomycosis of lung,	1
Actinomycosis of udder,	2
Actinomycosis of superior maxillary bone,	1
Angioma of liver,	1

Atalectasis,	1
Atalectasis and bronchitis,	2
Bronchitis (chronic),	2
Cancer of omentum,	1
Cysts of udder,	2
Cysts of kidney,	1
Dermoid cyst,	1
Fat foci in liver,	1
Fat foci in muscle,	1
Foreign body in heart,	1
Oesophagostoma,	2
Nephritis (chronic),	1
Mastitis,	3
Multiple necrosis of liver,	1
Pleuritis,	1
Pneumonia,	12
Tuberculosis of lungs,	8
Tuberculosis of lungs and pleura,	4
Tuberculosis of liver (peritoneal surface only),	2
Tuberculosis of larynx,	1
Tuberculosis of lymphatic glands (only glands sent),	5
Tuberculosis of omentum,	1
Tuberculosis of trachea,	1
Tuberculosis of udder,	4
Texas fever,	5
	— 82

Swine:—

Bronchitis and atalectasis,	1
Hepatitis (chronic interstitial),	1
Hog cholera,	2
Hydronephrosis,	1
Pericarditis (chronic),	1
Pleuritis (chronic),	1
Pneumonia and pleuritis,	1
Pneumonia,	2
Tuberculosis of lungs,	5
Tuberculosis of liver,	3
	— 18

Horses:—

Fibro-cysto-adenoma of intestine,	1
Glanders of lymphatic glands,	2
Glanders of lung,	2
Glanders of nasal septum,	2
	— 7
Normal organs examined,	24
Doubtful diagnosis,	3
Decomposed,	3
	— 30
Total of specimens examined,	137

Inoculations for Diagnosis of Glanders.

	Negative.	Positive.
Inoculation of nasal discharge from suspected horses,	12	5
Inoculation of discharge from supposed farcy-bud, .	3	3
Inoculation of discharge from lesion on instep of man,	—	1
	15	9
	—	—
		24

Rabies, 1897.

ANIMAL.	Town.	Rabbits Inoculated.	Appearance of First Symptoms.	Days Elapsed.
Newfoundland dog, .	Holyoke,	March 24,	April 6,	13
Pug dog,	Lynn, .	June 4,	June 16,	12
Cow,	Holyoke,	August 31,	September 21,	21
French poodle, . .	Melrose,	November 13,	November 29,	16

Number of negative inoculations,	2
Still under observation,	3

DISPOSITION OF TUBERCULOUS ANIMALS AND THE RESTRICTION OF
TUBERCULOSIS IN CATTLE.

Your honorable Board has requested me to express an opinion as to the existing laws regarding the disposition of tuberculous animals and methods of restriction of tuberculosis in cattle.

Disposition of Tuberculous Animals.

According to the letter of the present law, if a single tubercle, not even the size of a pin's head, is discovered in the body of an animal, such animal cannot be used for food, but is consigned to the rendering tank; moreover, the State must pay the owner of such animal its full value. Such a law, it seems to me, sanctions wanton waste of excellent food, and is far removed from the ground principles of economic science. The laws of the most advanced European States have been the outcome of careful observation, practical experience and scientific study. For the most part, they are essentially the same as the United States law covering this subject, and for the State of Massachusetts I advocate a law more in harmony with these than the present one is.

The Restriction of Tuberculosis in Cattle.

Though feeling strongly that our existing laws relating to this much-debated subject are inadequate, I am, without much more careful thought and study, unwilling to suggest others.

The thorough science of the Germans is universally respected; their laws covering every grade of meat inspection are admirable, and the result of the best thought and scientific study of men well able, therefore, to dictate; yet at present there are no laws in Germany especially relating to the subject in hand. The nation is not idle, however, and is carefully watching and investigating the experiments in progress in other countries, and, as an eminent scientist of our own land has perhaps well said, when they do adopt measures for the restriction of tuberculosis in cattle they will probably be wisely economic, more efficacious and in every way better than have as yet been attempted. I, therefore, advocate wise delay and a careful study of the shortly forthcoming recommendation to the German government now being prepared by one who has recently returned from Denmark, where he was sent to make an exhaustive study of Bang's work, methods and results. In these recommendations we may find many valuable suggestions applicable to our country with but slight alteration. At least, they may offer us new and better lines upon which to proceed. Nothing is to be gained by extreme haste. Tuberculosis has been of very gradual growth in our cattle, and it is possible that its decrease and final control must be also a gradual process. The peculiar nature of the disease seems to indicate this; it is not an acute infectious disease, and, therefore, should not be treated as such.

Before proceeding too hastily, would it not be judicious to inquire thoughtfully into the cause of the present crusade against tuberculous cattle? I therefore suggest the following for careful consideration:—

Why the slaughter of so many tuberculous cattle and the waste of so much good food? If the answer to this question is that it is to protect human beings against tuberculosis, we must then consider the following questions: Are tuberculous cattle and their products a cause of tuberculosis in man? If so, to what extent? Are there not other causes far more dangerous, and hence much more important to control?

In partial answer to the above queries it may be said that, although many cases of tuberculosis in human beings are thought to be directly traceable to cattle, not one, in the vast literature upon the subject of tuberculosis, has been authentically established, so that this question is still an open one. On the contrary, it is universally acknowledged that tuberculous people, especially through their sputum, are an immense source of infection to other people and to themselves. That tuberculosis in man may, in some instances, be referable to tuberculous cattle, I firmly believe; but

this source of danger is greatly minimized, when we consider other possibilities of infection.

Careful and regular inspection of dairy herds by competent veterinarians is, in my opinion, a duty that the State should not ignore; but that the inspectors should limit themselves to the detection of tuberculosis only, I believe to be unwise. Various inflammatory and septic conditions of the udder, for instance, are acknowledged causes of bad, unwholesome milk; it is, therefore, evident that milk from such udders should never be used. Pure milk, however, is dependent upon the general health of the animals supplying it, and this, in turn, is dependent upon good hygienic surroundings. Bad hygienic conditions, again, are conducive to the spread of tuberculosis; hence, broad work in this direction would materially assist in reducing the amount of tuberculosis in cattle. Therefore, until manifestly sound laws for the direct suppression of tuberculosis in cattle are forthcoming, there is a wide field for energetic labor which indirectly will gradually be attaining a similar end.

Respectfully submitted,

LANGDON FROTHINGHAM.

APPENDIX B.

PRELIMINARY REPORT UPON A COMPARATIVE STUDY OF TUBERCLE BACILLI FROM MAN (SPUTUM) AND FROM CATTLE.

BY THEOBALD SMITH, M.D.

For a number of years past the writer has been impressed with certain differences in the lesions produced in the guinea-pig by the tubercular products of cattle, on the one hand, and by sputum from human beings containing many tubercle bacilli, on the other. These differences are not great, nor are they easily described; but they were of sufficient moment to induce the writer to attempt some experiments, to find out to what extent they depended on differences in the bacilli of human and of bovine tuberculosis, and whether such differences were of sufficient intensity to be brought out by the bacteriological and pathological methods in use.

A beginning was made in 1895 with a fresh culture of bovine tubercle bacilli and a fresh culture of bacilli from an animal (*Nasua narica*) which had lived with a tuberculous master. It was assumed then, and all evidence is in favor of the assumption, that this animal had been infected from its master, and that the tubercle bacilli obtained from it could be classed as human. The careful study of other sputum bacilli subsequently also supports this assumption. The experiments made with these cultures have been fully reported elsewhere,* but I shall include them in the summary of the work done more recently, as the methods pursued are the same, and the results therefore comparable. No opportunity was given to continue this work until this year (1897), when the Board of Cattle Commissioners offered to furnish me cattle and to provide the food for their maintenance during the period of the experiments. At the same time, the State Board of Health, fully cognizant of the important bearing of this work

* Transactions Association American Physicians for 1896, pp. 75-93; twelfth and thirteenth annual reports of the Bureau of Animal Industry, United States Department of Agriculture, p. 149.

upon the public health, authorized me to use its laboratory facilities, without which aid a further pursuit of the subject would have been impossible. Some of the work was also done in the newly established laboratory of comparative pathology of the Harvard Medical School.

A full report of this work, including a description of the method employed for cultivating the bacilli of tuberculosis, the preliminary experiments upon small animals (rabbits and guinea-pigs) and the microscopic study of the diseased tissues of the animals experimented upon, will be given at another time. In this report I shall restrict myself to that portion of the work having reference to the immediate relationship and differences between human (sputum) and bovine tubercle bacilli, as determined by experiments upon cattle.

Inasmuch as up to the time of the first experiment nothing was known of the effects of bovine tubercle bacilli inoculated into cattle, and very little, if anything, of the effects of tubercle bacilli from man inoculated into the same species, the methods of dealing with this subject had to be, as it were, developed during the course of the work. One thing, however, was deemed essential. The tests to be made with human and with bovine bacilli upon cattle must be conducted under as uniform conditions as were possible, under the circumstances. Only by showing differences in the action of tubercle bacilli from these two sources under the same conditions can we prove any actually existing differences in the bacilli themselves. Absolute uniformity was unattainable, but I think the records will show with few exceptions a uniformity in all important details.

In all cases the various cultures of tubercle bacilli were isolated by me. Cultures of unknown age and source, borrowed from others, were not employed. Products of the disease, tuberculous tissue from cattle, in one case from swine, and sputum from human subjects were inoculated into guinea-pigs, and from them, after three to six weeks, cultures on dog's serum were obtained. These were tested subsequently upon rabbits and guinea-pigs, and lastly on cattle.

The mode of testing the cultures upon cattle deserves a brief description. In all cases the growth on blood serum was stirred up in sterile bouillon until a clouded suspension was obtained, which corresponded in depth to a bouillon culture of typhoid or hog-cholera bacilli about twenty-four to thirty-six hours old. This was injected with a hypodermic syringe into the thoracic cavity through the right chest wall, the intent being to deposit at least a portion of the suspension in the lung tissue. This method

of introducing the bacilli was chosen because it was likely to furnish the most uniform conditions, and also because tuberculosis of the organs of the chest is the most frequent form of disease among cattle.

Experiment I. — This, as stated above, was made in 1895, with two cultures, one from an old bull, with advanced generalized disease, involving also some of the bones, the other from a tuberculous animal probably infected from its tuberculous master.

Two heifers were inoculated with these cultures, as described above. The one receiving the bovine culture died in thirty-five days, with miliary tuberculosis of the lungs and general tuberculosis disseminated throughout the body. The one receiving the presumably human culture showed no signs of disease, and when killed fifty-four days after inoculation, not even a local lesion could be traced.

Experiment II. — This experiment was carried out two years later, in 1897, and included four head of cattle. The tubercle bacilli were obtained from the following sources: —

Sputum culture II., from a rapid case of phthisis in New Bedford, Mass.

Sputum culture III., from a subsequently fatal case of phthisis in Norwood, Mass.

Bovine culture II., from an old cow slaughtered in Lawrence, Mass., in which there was slight disease of the lungs and mediastinal glands (specimens brought me by Dr. Alexander Burr).

Swine culture I., from swine living under a cow barn in Massachusetts (specimens obtained by Dr. Austin Peters). This culture in every way appeared identical with the bovine cultures, and this, together with the fact that the swine were exposed to infection from cattle, led me to assume that this was a bovine culture in origin.

On May 1, 1897, these four cultures were injected into four head of cattle. The total age of the cultures, or, in other words, the total period of time during which they had been growing on dog's serum, was as follows: —

Sputum culture II., five months, nine days old, eighth transfer.

Sputum culture III., two months, fifteen days old, fourth transfer.

Bovine culture II., five months, two days old, fifth transfer.

Swine culture I., eleven months, twenty-three days old, sixteenth transfer.

Assuming that tubercle bacilli become slowly weakened in virulence by artificial cultivation, we should endeavor to use cultures as fresh and of as nearly the same age as possible. This

theoretical demand cannot be successfully met, because of the many difficulties surrounding such work. Of the four cultures used, sputum II. and bovine II. are of nearly the same age, while sputum III. is but half as old as they, and swine I. more than twice as old. In making the injection, the space between the sixth and the seventh rib was chosen. The needle was inserted about three inches above the level of the elbow (olecranon process). It was found subsequently at the autopsy that the point chosen was too low, and that in all of the animals the needle, leaving the lungs intact, pierced the diaphragm. Some of the bacilli were thus discharged into the abdominal cavity.

Bearing this unforeseen accident in mind, we may now go to a description of the further history of the inoculated cattle. They were all housed in a spacious, well-ventilated barn, in large, commodious horse stalls. A piece of ground adjoining the barn was enclosed, and in this the animals spent six to seven hours a day for about four weeks. Thereafter the animals were separated into two lots, one lot being out several hours in the morning, the other several hours in the afternoon. The two which received the bovine and the swine culture were allowed to run together, similarly the two which received the sputum cultures. It might be claimed that there was in this arrangement a possible danger of transmitting the bacilli from one animal to another, and of infecting the ground. There was no evidence of this at the post-mortem examination; and the arrangement was considered safe at the start, because it takes some time for the tuberculous tissue to become disintegrated. Only when this has set in can we consider the passage of bacilli from one animal to another possible. It was, however, deemed prudent not to keep the animals longer than two months, on account of the imperfect isolation.

In apportioning the cultures to the animals, the sputum cultures were injected into the youngest animals, in order that these cultures might have any advantage likely to accrue from differences in age. Two yearlings (without any permanent incisor teeth) received the two sputum cultures, the bovine culture was injected into a heifer about two and one-half years old, the swine culture into a heifer about two years old.

They were killed and examined at the Brighton abattoirs, with the co-operation of the Board, just two months after the day of the injection. Before inoculation these animals had been tested with tuberculin by the Board, and found free from tuberculosis. Still, since this agent occasionally allows an animal to escape which contains foci of the disease, attention was directed to this point at the autopsies. No lesion, however, was found, which

from its situation and appearance could be referred to any former spontaneous infection.

Let us examine first the effect of sputum culture II. and bovine culture II. which were of nearly the same age when injected.

The weight of the yearling (2616) receiving the sputum culture had risen in the two months from 520 to 580 pounds, that of the heifer (2635) from 650 to 710 pounds. There was no continuous fever recognized in either animal, though the temperature was taken twice a day, morning and afternoon. The fluctuations noticed were evidently due to the effect of the sun while the animals were in the enclosure.

The lesions in the yearling (2616) were very slight. At the seat of inoculation, between the sixth and seventh ribs, a mass of tubercles attached to pleura about one by one-half inch dimension, the tubercles composing it partly cheesy, partly firm. Near cephalic border of ventral lobe of right lung, a sub-pleural nodule, not yet necrotic, about one-eighth inch in diameter. On abdominal aspect of diaphragm, right side, about twenty-four isolated tubercles, each one-twelfth to one-eighth inch in diameter, uniformly yellowish in color. A few similar tubercles on the omentum. Slight adhesion of omentum. When adhesion removed, about six or seven nodules found on cæcum, one-twelfth inch in diameter. Evidently the injection needle had passed through diaphragm into abdomen, deposited some fluid there and some in thorax when partly withdrawn.

The lesions in the heifer which had received the bovine culture were quite extensive, and were diffused through thorax and abdomen, owing to the penetration of the diaphragm by the needle of the injection syringe:—

Thorax: The right pleural cavity shows an abundant eruption of tubercles along the lateral margin of the ribs. Some of the masses formed are characteristically flattish, grape-like, and in bulk quite large. One mass measured eight by three by one inch. Others of similar dimensions were present. On the lateral margin of the right lung a series of loosely attached flattish neoplasms, up to two inches in diameter, besides hyperæmic fringes of loose connective tissue. On the convex surface of this lung only a few tubercles. Large patches of tubercles on pericardium and diaphragm.

In the muscular portion of diaphragm, right side, a mass of tuberculous tissue (probably place where needle penetrated), one and one-half by one and one-half by one-half inch in dimension. The most caudal of the series of dorsal mediastinal glands about twice normal size, on account of the presence of many small foci, showing in some cases an opaque, yellowish centre.

Abdomen: The omentum densely studded with agglomerations of tubercles, covering the greater part of its surface. These masses vary

up to one-half inch in thickness. Similar patches on abdominal aspect of diaphragm and on spleen. Fewer patches on gall bladder and on the liver. In one of the portal glands a one-quarter inch focus, pale, grayish, permeated with small, calcareous spicules.

We have in these cases a wide divergence in the result of the inoculation. The human bacillus produced a slight eruption of small, tubercle-like bodies, which did not even present microscopically the characters of true tubercles; while the bovine bacillus produced an exquisite case of pearly disease both in thorax and abdomen, with the formation of large, grape-like masses in the chest. These, under the microscope, presented all the characters of genuine tubercles, and contained tubercle bacilli.

The youngest sputum culture (No. III.) was injected into a yearling weighing 410 pounds. At the end of two months the weight had risen to 480 pounds. The lesions found are slight: —

On the abdominal aspect of diaphragm, right side, a patch of isolated tubercles about two inches in diameter, the tubercles themselves about one-sixth inch diameter, and about one-half inch apart. They are grayish, opaque. At place of inoculation, on serous aspect of ribs a flattish neoplasm, one inch in diameter and about one-eighth inch thick. Other lesions not detected.

In this case also the needle evidently entered abdomen through diaphragm. The notes show very little disturbance as the result of the inoculation.

The swine culture was injected into a somewhat older animal, weighing 620 pounds. After two months the weight was 660 pounds. The autopsy showed the following condition: —

At place of inoculation (right chest wall) a subcutaneous tumor about two inches in diameter, made up of a very dense connective tissue sac one-quarter inch thick, and which encloses a pale, yellowish semifluid mass. . . . There are besides this focus in the same situation three smaller nodules, from one-half to three-fourths inch in diameter, the largest with caseous centre. On the pleural aspect a similar one-half inch centrally softened focus.

In nearly the centre of the right half of diaphragm and projecting into abdomen for one-half inch is a tumor representing a portion of a larger focus in the muscular portion of the diaphragm about one inch in diameter. This focus is likewise caseous diffuent centrally. On all the ribs of right pleural cavity are eruptions of small tubercles, reaching in some instances a diameter of one-eighth inch. Besides the palpable tubercles there is along one border of each rib a line of vascular fringes of connective tissue. In many of these fringes tubercles not noticed, although the fringes themselves are evidently a result of the injection.

Along the lateral border of the right lung similar vascular fringes of tissue containing tubercles. These fringes extend dorsad for about two inches on ventral and cephalic lobes.

Diffuse eruption of minute tubercles on pleural aspect of diaphragm, right half

Large caudal mediastinal gland contains large numbers of tubercles, varying in size from mere points to those one-eighth inch in diameter, and showing beginning necrosis. Left bronchial gland several times normal size. Ventral mediastinal gland several times normal size, and containing several large centrally caseous foci. One mesenteric gland contains several small necrotic tubercles.

In this case many of the bacilli had been deposited in the fleshy portion of the diaphragm and some under the skin, and they were thus prevented from exerting their greatest power; nevertheless, the lesions are quite severe. It is not improbable that this culture would have been much more destructive had it been used six or seven months earlier.

Experiment III. — This comprised six head of cattle. The details of the experiment do not differ from those of experiment II. The animals had been tested with tuberculin under the direction of the Board.

The cultures of tubercle bacilli used in these tests were from cases of human and bovine disease, and comparatively fresh: —

Sputum culture IV., six months, ten days old, from a case of phthisis in Melrose, Mass. Patient was subsequently reported recovered.

Sputum culture V., one month, nineteen days old, from a case of phthisis of about two years' standing (New Hampshire).

Sputum culture VI., one month, twelve days old, from a case of phthisis in Winthrop, Mass.

Bovine culture III., four months, seven days old, from a cow with advanced lesions of lungs and liver (probably from Carlisle, Mass.).

Bovine culture IV., four months, three days old, from a cow with slight disease of mediastinal glands.

Bovine culture V., four months, three days old, from a cow with moderate disease of the lungs and portal gland.

This set of cultures is thus younger than the preceding set, with odds in favor of two of the sputum cultures. The bovine cultures were of nearly the same age.

The animals at my disposal were, unfortunately, not of the same age, and in assigning the cultures the advantage was given to the human cultures: —

Sputum IV., yearling, 525 pounds, no permanent incisor teeth.

Bovine III., yearling bull, 645 pounds, no permanent incisor teeth.

Sputum V., cow, 675 pounds, about four years old.

Bovine IV., cow, 850 pounds, about twelve years old.

Sputum VI., cow, 865 pounds, about three and one-half years old.

Bovine V., cow, 875 pounds, about six years old.

The injection of the cultures was carried out as in experiment II., excepting that the point of insertion of the needle was chosen higher up, about eleven inches above the elbow of the animal when in the standing position. The length of the needles used was about two inches.

The care of the animals was the same as that bestowed on the preceding lot, excepting that the bovine and the sputum animals were kept separate in the out-door enclosure from the start, the one lot being out in the morning, the other in the afternoon. They were kept two months, with the exception of the young bull (bovine culture III.), which died seventeen days after the inoculation. The four cows of this lot gave at the start altogether about eight quarts of milk. The amount slowly diminished, until in the sixth week a very little, amounting perhaps to one quart in two days, was removed. The milking was continued chiefly to prevent any udder troubles during the experiment, and to maintain normal conditions. The temperature was taken but once a day, at noon.

In comparing the temperature records of these six animals, it was noticed that the three animals which received the bovine cultures had a high temperature immediately after the inoculation, which lasted until the death of the bull and about three weeks for the remaining two animals. At the same time, no such elevation of temperature was recorded for the animals receiving the three sputum cultures. There was but one well-defined rise of temperature in case of the yearling, from the thirteenth to the sixteenth day after inoculation. The other irregularities are probably due to the fact that the temperature was usually taken after these animals had been in the enclosure in the sunshine for several hours. Those with the high temperature were kept much of the time in the cool barn in the morning, which probably depressed the fever curve somewhat. These temperature records are given at the end of this article. After the period of fever no other elevations were noted up to the close of the experiment.

The young bull, inoculated with bovine culture III., showed, besides the prompt onset of a high temperature, general and local disturbances about a week after the inoculation. The breathing became rapid, the appetite had partly gone. Emaciation and weakness supervened. He was unable to get up September 11, and died the following night.

The autopsy revealed a severe miliary tuberculosis of both lungs, with marked congestion and cedema of the organ. Normal collapse no longer possible. The associated lymph glands were much enlarged and infiltrated with minute tubercles. Patches of minute tubercles were found on the pleural covering of ribs and on the omentum. In the liver many minute tubercles were found in sections. In these, as well as in the tubercles of the lungs and mediastinal glands, tubercle bacilli were very abundant. The other organs have not yet been examined microscopically.

On October 27, the remaining five animals were killed at the Brighton abattoirs, with the co-operation and assistance of the Board.

The three sputum animals had all gained in weight:—

Yearling (sputum IV.), from 525 to 610 pounds.

Cow (sputum V.), from 675 to 750 pounds.

Cow (sputum VI.), from 865 to 960 pounds.

No. 79 (sputum culture IV.).—Yearling. One permanent incisor on the right has appeared since date of inoculation. In utero a fœtus about three months old. At point of inoculation in the subcutaneous tissue a small nodule about one-quarter inch diameter, with contents soft, cheesy. Attached to this is another smaller nodule, about one-eighth inch diameter.

On the right side of chest wall, pleural aspect, there are attached along the six caudal ribs, soft, dark-red, pendulous masses of newly formed connective, highly vascular tissue. At point of inoculation, between seventh and eighth ribs, a flattish pedicled mass of tissue of brownish-red color. On the tenth rib another mass, about three-eighths inch diameter. The left side of thorax is normal.

Right lung: On the small (cephalic and ventral) lobes newly formed, delicate fringes of hyperæmic connective tissue, which appears along the free lateral margin as a delicate band about one-half inch broad, as well as on a portion of the surface of the lung, occupying exclusively the lines representing the boundaries of the lobules.

In the large caudal lobe, which is similarly beset with the vascular fringes, a tumor, representing the place where needle penetrated lung tissue, projecting slightly above the convex surface, is found two inches from the caudal tip. This tumor, about three-quarters inch in diameter, contained a completely disintegrated mass and about a dozen foci, one-sixteenth to one-eighth inch in diameter, with yellow softened centre. On the margin of this same lobe, in addition to the vascular fringes are four firm masses of grayish tissue, smooth, flattish, attached by pedicles to margin of the lobe. Their largest diameter is from one-quarter to one-half inch.

On large (caudal) lobe of left lung there is only a very little development of vascular fringes. Imbedded in the same lobe near lateral margin is a uniformly grayish, slightly translucent mass, sharply defined from the enveloping normal lung tissue.

Attached to the cephalic lobe of the left lung by a pedicle is a small, flattish, smooth mass of new tissue.

The pleural aspect of diaphragm and portions of the pericardium are covered with areas of the highly vascular, neoplastic tissue. In some, small nodules can be felt at the free extremity of this tissue.

On the right ventricular surface of the heart four flattish pedicled masses, about as large as split peas, are attached.

The various lymph gland systems, ventral and dorsal mediastinal and bronchial glands, do not show the presence of tubercles or any augmentation of size.

No. 39 (sputum culture V.). — Cow about four years old. In utero a foetus three to four months old.

Development of vascular fringes along one border of ribs of the right side of thorax, as in preceding case, but amount slight, compared with that case. In the intercostal muscles at the point of inoculation a mass of perhaps a dozen small, grayish tubercles.

Right lung: In the large caudal lobe, in the same situation as preceding case, a projecting tumor about one inch in diameter. When incised it is found composed of two one-half inch foci of disintegrated cheesy-viscid matter, enclosed in thin, smooth capsules. No surrounding infiltration.

Along the margin and on the caudal surface of this lobe slight development of pendulous vascular tissue and a sessile tubercle about three-sixteenths inch diameter. On the left caudal lobe only very slight production of vascular tissue.

On the surface of one of the middle dorsal mediastinal glands an aggregation of minute tubercles one-half inch in diameter. Imbedded in the cortex of the same gland two minute tubercles.

No. 76 (sputum culture VI.). — In utero a foetus about four months old.

Within the thorax, on the right side, between the seventh and eighth ribs, is a small, pedicled, blackish (hemorrhagic) mass of firm tissue about as large as a pumpkin seed, another on the tenth rib. On most of the ribs behind the seventh are gelatinous-looking pendulous vascular fringes of neoplastic tissue. On the pleural surface of the diaphragm a similar development of vascular tissue and several firm pedicled masses like those on ribs.

Of the right lung the cephalic lobe shows very slight formation of marginal fringes. In the ventral lobe, whose tip is adherent to the pericardial fat, a uniformly grayish, sharply defined focus, one-quarter inch in diameter.

In the same situation as in the preceding cases the caudal lobe shows a slightly projecting tumor, about one and three-quarters inches in diameter externally. When incised it is found to consist of a smooth-walled sac, one and one quarter inches diameter, containing a yellowish curdy mass, together with a little turbid fluid. No surrounding infiltration. On the convex surface of this lobe there is a slight growth of vascular tissue. Near the caudal tip a flattish mass, partly yellowish, partly blackish, attached by loose tissue to the margin of the lobe.

In the abdomen, a flattish, sessile mass of pinkish gray tissue, about three-quarters of an inch in its longest diameter, attached to omentum *

Of the three animals receiving bovine tubercle cultures, the fate of one (young bull No. 71) has already been given. The two other cases remained stationary in weight:—

No. 88, original weight, 850 pounds; weight at end of experiment, 850 pounds.

No. 63, original weight, 875 pounds; weight at end of experiment, 970 pounds.

The autopsy notes are in brief as follows:—

No. 63 (bovine culture V.).—White cow, spotted with red. Horns sawed off. Probably six years old. Fœtus in utero, about two months old.

Thorax: Right lung adherent to chest wall in several places. At point of inoculation, between seventh and eighth ribs, an exerescence, about three-quarters inch in diameter, of dense, pearly-looking connective tissue, enclosing a disintegrated mass. Numerous masses and aggregations of small tubercles on all ribs; these in some cases several inches in length. The left side of thoracic wall, below the level of the point of inoculation on the opposite side, is covered with a uniform, pinkish-gray deposit of very minute tubercles. Eruptions of tubercles on pleural surface diaphragm and on pleural covering of dorsal mediastinal space.

On caudal lobe of right lung a considerable number of tubercular masses, flattish, sessile, from one-eighth to three-quarters inch in diameter. Between the cephalo-lateral border of this lobe and the pericardium is a mass of newly-formed tissue, dense, in which are imbedded many minute yellow tubercles and masses of pericardial fat. The whole is about as large as a fist. It binds the lung tissue, pericardium and diaphragm together.

Many tubercles on the caudal surface of this same lobe.

There is no distinct focus in this lobe, as a result of the injection, and it is probable that much of the fluid was deposited in the pleural cavity. But palpation reveals throughout both lungs small shot-like bodies, in close proximity. On section numerous yellow tubercles from one-thirty-second to one-sixteenth inch in diameter are found imbedded in the lung tissue of all lobes.

The dorsal mediastinal lymph glands are all several times normal dimensions. They contain many coalescing yellow tubercles. The ventral (anterior) mediastinal glands are similarly enlarged, and the cut surface shows a uniformly cheesy parenchyma.

Minute grayish points under the capsule of the liver.

* The character of these peculiar formations will be described in a subsequent report.

In the spleen, all malpighian bodies converted into tubercles with yellow, opaque centre. In left kidney several minute grayish tubercles.

No. 88 (bovine culture IV.). — Red and white cow. Teeth very much worn; probably twelve years old; dehorned. Not pregnant.

Thorax: No deposit at point of inoculation. The eruptions of tubercles on the costal pleura of the right and the left side are in character very much like those of the preceding case (No. 63), but less extensive.

Right lung: Lobes adherent to pericardium. Adhesions readily severed. On convex surface of the caudal lobe of this side a considerable number of flattish sessile tubercles, from one-sixteenth to one-half inch broad. The caudal aspect of this lobe is similarly beset with them, but in less abundance. Along the margin of this lobe are loosely attached small elongated masses of tubercles.

At the same situation in this lobe as in the sputum cases there is a fluctuating tumor, about two inches in diameter, slightly projecting. It consists of a capsule with nearly smooth walls, enclosing a soft caseous mass. It is surrounded by a zone of small necrotic tubercles, and with lobules containing numerous minute grayish foci.

On the cephalic lobe of the right lung a considerable number of grayish tubercles. Throughout all lobes are many tubercles in the lung tissue, some very minute, others larger and opaque, yellowish in color.

The pleura in the dorsal mediastinal space is beset with a large number of small tubercles, similarly the pericardium. The right half of the diaphragm is beset with flattened aggregations of tubercles. Between the ventral lobe of the right lung and the pericardium, and fastening them together, is a mass of newly formed connective tissue and fat, enclosing numerous softened foci.

The large dorsal mediastinal lymph gland is enlarged, and contains a large number of yellow tubercles. The central portion of the gland is uniformly caseous. In the left bronchial gland, a small number of tubercles; in the ventral mediastinal glands, a considerable number.

Organs of the abdomen appear free from visible tuberculous changes.

A summary of the outcome of this last experiment may now be made.

The points of difference between the inoculation disease produced by bovine and by human (sputum) bacilli are several: —

1. The bovine cases either remained stationary in weight or lost slightly, while the sputum cases gained seventy-five to eighty-five pounds. Still, the age of one of the bovine cases may be partly responsible for stationary weight.

2. There was marked fever in the bovine cases for three weeks after the inoculation, practically none in the sputum cases.

3. There were well-marked differences in the lesions produced. In the sputum cases the lesions are practically the same, and consisted in: —

(a) A tumor in the right caudal lobe of the lungs, about one inch in diameter, projecting somewhat above the surface of the lung. This

represents the place where the needle penetrated into the lung tissue and deposited the tubercle bacilli. In each case the contents of this tumor were softened and converted into a curdy mass, enclosed in a thin-walled capsule, smooth internally. The disease was not spreading from this point, nor were tubercles visible in the lymph glands of the lungs and thorax, excepting in one gland of No. 39.

(b) The free margin of the right lung, the pleural covering in part and the pleural covering of the ribs on the right side were beset with a new formation of loose vascular fringes or shreds, in which in only one case some minute nodules could be felt, also some flattish pedicled masses, not resembling tubercles.

Among the bovine cases we have the following characteristic points to note :—

(a) Disseminated tuberculosis of the lungs, severest and fatal in No. 71, the youngest, least pronounced in the oldest, No. 88. Associated with this, a local disintegrated focus in the lungs of No. 88.

(b) Tubercular deposits on lungs, pericardium and diaphragm, and the ribs, resembling closely the product of the natural disease in cattle. The few pedicled masses attached to the pleura in the sputum cases bore no direct resemblance to tuberculous outgrowths, although they are undoubtedly the result of the inoculation.

(c) Extensive tuberculosis of all or nearly all the lymph glands of the thorax, including both mediastinal chains.

(d) Tuberculosis of other organs, spleen, liver, kidney, in two out of three cases.

A summary of the three separate experiments, in which 12 animals were used, shows that :—

6 animals were inoculated with human bacilli.

5 animals were inoculated with bovine bacilli.

1 animal was inoculated with swine bacilli.

Of the 6 sputum cases :—

1 showed no disease.

2 showed very slight lesions.

3 showed only local lesions without dissemination.

Of the 5 bovine cases :—

2 died of generalized disease.

2 showed extensive lesions.

1 showed less extensive lesions.

In the swine case (probably originally bovine) the lesions were less extensive than in the bovine cases.

In these three experiments the conditions were kept as nearly uniform as was possible, with the means at my disposal. It was unfortunate that an animal as old as No. 88 (bovine IV.) should have been included; it is also to be regretted that the swine culture was about a year old when used upon cattle. Undoubtedly the total absence of any lesions following the injection of the *Nasua* culture is partly due to the age of the culture. Leaving these aside, the remaining parts of the test appear to me to be of sufficient uniformity and accuracy to justify us in drawing certain preliminary inferences. We may now maintain that bovine tubercle bacilli and human bacilli as found in sputum are not identical. The difference in their action upon cattle is reinforced by certain differences in the bacilli themselves and their effect upon rabbits, as will be detailed in a fuller report.

What the significance of these divergencies is, what influence they have upon the transmissibility of the disease from cattle to man, we are unable at present to state with any degree of certainty. That they do have some effect must be admitted, in view of results of studies upon other species of pathogenic bacteria. Their precise bearing needs careful investigation.

These studies will, I think, warrant one inference, however; that is, that human sputum cannot be regarded as specially dangerous to cattle, nor can it be looked upon as a factor in the introduction of tuberculosis into a healthy herd of cattle. Even if the tubercle bacilli of cattle and of man are very closely related and have the same ancestry, as we all must admit, if we regard the two as mere varieties, which may eventually under very favorable conditions pass one into the other, the condition in which the bacillus leaves the lungs in sputum is evidently such as to interfere, *under ordinary circumstances*, with any development in the bovine body. It would fall a speedy prey to destruction.

I refrain, for obvious reasons, from drawing the conclusions that all human tubercle bacilli are like those existing in the sputum of phthisis. On this point we are still in the dark.

The following pages give a concise tabular account of the cultures employed in these investigations, of the animals upon which they were tested and the temperature records of the third experiment. Those of the second experiment, as stated above, reveal no essential differences between the different animals, and are therefore omitted.

TABLE I.

DESIGNATION OF CULTURE.	SOURCE OF CULTURE.	Date when Artificial Cultivation began.	Date of Inoculation into Cattle.	Total Age of Culture.	Number of Transfer.
				Months. Days.	
Bovine I.,	Old bull (Virginia). Extensive disease, probably of long standing; bones infected.	Dec. 1, 1894,	May 4, 1895,	5 4	3d.
<i>Nasua narica</i> (human sputum), . .	Household pet of phthisical patient (Washington, D. C.).	July 26, 1894,	May 4, 1895,	9 9	8th.
Sputum II.,	Rapid case of phthisis (New Bedford, Mass.), . .	Nov. 21, 1896,	May 1, 1897,	5 9	8th.
Sputum III.,	Fatal case of phthisis (Norwood, Mass.), . . .	Feb. 15, 1897,	May 1, 1897,	2 15	4th.
Bovine II.,	Old cow with slight lesions of lungs and mediastinal glands (Lawrence, Mass.).	Nov. 28, 1896,	May 1, 1897,	5 2	5th.
Swine I.,	Pig, living under cow barn (Framingham, Mass.), .	May 8, 1896,	May 1, 1897,	11 23	16th.
Sputum IV.,	From case of phthisis, subsequently reported as recovered (Melrose, Mass.).	Feb. 16, 1897,	Aug. 26, 1897,	6 10	7th.
Sputum V.,	From a stationary case of phthisis (New Hampshire), covered (Melrose, Mass.).	July 7, 1897,	Aug. 26, 1897,	1 19	3d.
Sputum VI.,	From a case of phthisis (Winthrop, Mass.), subsequent history unknown.	July 14, 1897,	Aug. 26, 1897,	1 12	3d.
Bovine III.,	Cow with advanced tuberculosis of lungs and liver (Carlisle (?), Mass.).	April 19, 1897,	Aug. 26, 1897,	4 7	5th.
Bovine IV.,	Cow with slight disease of dorsal mediastinal glands (Billerica, Mass.).	April 23, 1897,	Aug. 26, 1897,	4 3	5th.
Bovine V.,	Cow with moderate lesions of lungs and portal gland (Carlisle, Mass.).	April 23, 1897,	Aug. 26, 1897,	4 3	5th.

TABLE II.

Amount of Suspension of Bacilli injected.	Designation of Culture.	Age of Culture used.	Designation of Animal.	Age, etc.	Original Weight.	Final Weight.	Date of Inoculation.	Result.
4 cc.,	Bovine I, .	Days. 10	No. 284,	Heifer, 2½ years old; common stock, pregnant.	Pounds. ?	?	May 4, 1895, .	Died in thirty-five days, of general miliary tuberculosis.
4 cc.,	<i>Nasua narica</i> , .	10	No. 300,	Heifer, 2½ years old, .	?	?	May 4, 1895, .	Killed June 27, 1895; no lesions.
2 cc.,	Sputum II., .	9	No. 2616,	Yearling,	520	580	May 1, 1897, .	Killed July 1, 1897; lesions very slight.
2 cc.,	Sputum III., .	9	No. 2634,	Yearling,	410	480	May 1, 1897, .	Killed July 1, 1897; lesions very slight.
2 cc.,	Bovine II., .	9	No. 2635,	Heifer, 2½ years old, .	650	710	May 1, 1897, .	Killed July 1, 1897; extensive pearly disease in thorax and abdomen.
2 cc.,	Swine I., .	13	No. 2672,	Heifer, 2 years old, .	620	660	May 1, 1897, .	Killed July 1, 1897; well marked pleural tuberculosis, with invasion of lymph glands.
2 cc.,	Sputum IV., .	9	No. 79,	Yearling, about 1½ years old.	525	610	Aug. 26, 1897, .	Killed October 27; abscess in lungs at point of injection, new vascular fissure on ribs and lungs.
2 cc.,	Sputum IV., .	9	No. 39,	Cow, 4 years old, .	675	750	Aug. 26, 1897, .	Killed October 27; lesions same as preceding.
2 cc.,	Sputum VI., .	9	No. 76,	Cow, 3 years old, .	865	950	Aug. 26, 1897, .	Killed October 27; lesions same as preceding.
2 cc.,	Bovine III., .	9	No. 71,	Bull, yearling,	645	575*	Aug. 26, 1896, .	Died September 12; miliary tuberculosis of lungs, liver.
2 cc.,	Bovine IV., .	9	No. 88,	Cow, about 12 years old, .	850	850	Aug. 26, 1897, .	Killed October 27; many minute tubercles in lungs, tuberculous deposits on pleura.
2 cc.,	Bovine V., .	9	No. 63,	Cow, about 6 years old, .	875	870	Aug. 26, 1897, .	Killed October 27; disseminated tuberculosis of lungs and spleen.

* Two days before death.

TABLE III.

DATE.	BOVINE SERIES (Number of Animal).			SPUTUM SERIES (Number of Animal).			Remarks.
	71	88	63	39	76	79	
Ang. 24, 11.30 A.M.	Temp. 101.4	Temp. 101.2	Temp. 101.8	Temp. 101.8	Temp. 100.0	Temp. 102.0	- -
25, 11.30 "	101.2	101.8	101.8	101.2	101.8	101.2	- -
26, 1 P.M.	102.8	101.4	101.6	101.8	101.4	100.8	Inoculation 9.10 A.M.
27, 1 "	104.6	102.6	105.4	101.8	103.8	102.6	- -
28, 1 "	104.0	101.6	105.2	102.0	102.4	102.4	- -
29, . . .	-	-	-	-	-	-	- -
30, 1 P.M.	103.4	106.0	104.2	101.4	101.8	102.6	- -
31, 1 "	102.8	108.0	105.0	101.2	102.0	102.8	B.* Probably out in morning to date although record not kept.
Sept. 1, 1 "	103.4	105.6	104.0	102.4	103.8	102.0	S.† Out in morning.
2, 1 "	102.0	103.4	103.2	101.2	101.0	101.4	- -
3, 1 "	103.2	101.0	103.2	101.8	101.4	101.2	S.† Out in morning.
4, 1.30 "	105.4	103.4	104.4	101.0	100.6	100.8	S.† " "
5, . . .	-	-	-	-	-	-	- -
6, 1 P.M.	107.0	100.8	102.2	100.6	100.8	101.0	- -
7, 1 "	106.6	101.2	105.6	100.4	100.6	100.6	B.* Out in morning.
8, 1 "	107.8	102.4	102.8	101.2	101.0	102.0	S.† " "
9, 1 "	107.2	105.4	104.6	101.4	101.4	102.6	S.† " "
10, 1 "	107.0	104.4	103.0	102.0	102.4	104.4	S.† " "
11, 1 "	104.8	105.0	104.0	101.4	101.2	101.6	S.† " "
12, . . .	-†	-	-	-	-	-	- -
13, 1 P.M.	-	103.0	102.0	101.0	101.2	101.6	S.† Out in morning.
14, 1 "	-	102.4	102.6	101.4	101.0	102.6	S.† " "
15, 1 "	-	101.0	101.8	101.0	101.4	102.0	S.† " "
16, 1 "	-	101.4	101.0	101.6	102.0	102.6	S.† " "
17, 1 "	-	100.4	100.4	100.8	101.4	101.6	S.† " "
18, 1 "	-	99.8	99.8	101.6	101.4	102.4	S.† " "
19, . . .	-	-	-	-	-	-	- -
20, 1 P.M.	-	100.0	100.6	101.2	101.2	101.8	S.† Out in morning.
21, 1 "	-	99.8	100.6	101.0	101.2	101.6	S.† " "
22, 1 "	-	99.2	99.0	101.2	100.8	101.6	S.† " "
23, 1 "	-	99.8	101.0	101.0	101.2	101.6	S.† " "
24, 1 "	-	100.4	100.4	101.2	101.6	102.0	S.† " "

* Bovine case.

† Sputum case.

‡ Dead.

TABLE III. — *Concluded.*

DATE.	BOVINE SERIES (Number of Animal).			SPUTUM SERIES (Number of Animal).			Remarks.
	71	88	63	39	76	79	
Sept. 25, 1 P.M.	Temp. —	Temp. 100.4	Temp. 99.8	Temp. 101.2	Temp. 101.8	Temp. 101.8	S.† Out in morning.
26, . . .	—	—	—	—	—	—	— —
27, 1 P.M.	—	100.4	98.4	101.0	100.8	101.4	S.† Out in morning.
28, 1 “	—	100.2	100.6	100.4	100.8	101.8	S.† “ “
29, 1 “	—	98.8	99.0	100.8	101.0	102.0	S.† “ “
30, 1 “	—	101.4	100.4	101.0	101.6	101.6	S.† “ “
Oct. 1, 11.45 A.M.	—	99.8	100.6	100.8	101.0	101.8	S.† “ “
2, 1 P.M.	—	99.2	100.0	101.0	100.8	101.8	S.† “ “
3, . . .	—	—	—	—	—	—	— —
4, 1 P.M.	—	99.0	99.0	100.0	100.6	101.8	S.† Out in morning.
5, 1 “	—	99.4	100.2	101.0	101.0	101.8	S.† “ “
6, 1 “	—	99.6	101.0	102.4	100.2	101.4	S.† “ “
7, 1 “	—	99.0	100.2	100.0	101.2	101.6	S.† “ “
8, 1 “	—	99.0	100.8	100.2	99.8	101.8	S.† “ “
9, 1 “	—	99.2	100.8	100.4	101.0	101.8	S.† “ “
10, . . .	—	—	—	—	—	—	— —
11, 1 P.M.	—	100.0	98.8	99.8	100.0	100.8	S.† Out in morning.
12, 1 “	—	100.2	100.8	100.6	101.4	101.4	S.† “ “
13, 1 “	—	100.2	100.4	100.6	100.8	101.4	S.† “ “
14, 1.30 “	—	99.8	99.8	100.2	100.8	101.4	S.† “ “
15, 1 “	—	100.2	100.4	100.4	101.8	101.4	S.† “ “
16, 1 “	—	100.8	101.8	101.4	102.0	101.8	S.† “ “
17, . . .	—	—	—	—	—	—	— —
18, 1 P.M.	—	97.2	97.8	100.8	100.6	101.2	S.† Out in morning.
19, 1 “	—	100.4	100.2	100.8	99.0	100.8	S.† “ “
20, 1 “	—	101.8	100.0	100.0	99.0	100.6	S.† “ “
21, 1 “	—	98.8	101.4	101.0	99.0	100.8	S.† “ “
22, 1 “	—	100.0	102.0	100.2	98.8	100.2	S.† “ “
23, 1 “	—	100.6	101.4	96.8	99.4	100.4	S.† “ “
24, . . .	—	—	—	—	—	—	— —
25, 1 P.M.	—	100.0	100.4	99.4	99.0	100.4	S.† Out in morning.
26, 1 “	—	100.6	100.8	99.4	98.8	100.8	S.† “ “

† Sputum case.

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